

## Taxonomic notes on the group of *Loepa miranda*, 2: The subgroup of *Loepa damartisi* (Lepidoptera: Saturniidae)<sup>1</sup>

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**Abstract:** A review on the taxa of the subgroup of *Loepa damartisi* JORDAN, 1911 from China is presented. For the following four taxa **lectotypes are designated** (all males): *L. katinka kuangtungensis* MELL, 1939 (in MAKB Bonn), *L. katinka septentrionalis* MELL, 1939 (in ZMHU Berlin) (these two taxa being members of the species-group of *katinka*), *L. miranda taipeishanis* MELL, 1939 (in MAKB Bonn), and *L. miranda septentrionalis* MELL, 1939 (in MAKB Bonn); all four taxa are dealt with on full species status (partly **stat. n.**). *L. miranda septentrionalis* and *L. katinka septentrionalis* are **primary homonyms**. Based on “first revisors’ choice”, *L. katinka septentrionalis* is given preference over *L. miranda*  $\dagger$ *septentrionalis*, and the junior subjective synonym *L. wlingana* YANG, 1978 is taken as the **replacement name** for the latter. Also *L. damartisi szechwana* ZHU & WANG, 1993 is found to be a junior subjective synonym of *L. wlingana* (**syn. n.**). Two species are described as new: *L. elongata* **sp. n.**, holotype male from Sichuan (in ZMHU Berlin), and *L. melli* **sp. n.**, holotype male from Gansu (in ZMHU Berlin). All taxa including their holotypes respectively lectotypes and their male genitalia are figured.

**Key words:** *Loepa damartisi* subgroup, *Loepa taipeishanis*, *Loepa kuangtungensis*, *Loepa septentrionalis*, homonymy, replacement name, lectotype designations, new species, China

### Taxonomische Bemerkungen zur Artengruppe von *Loepa miranda*, 2: Die Untergruppe von *Loepa damartisi* (Lepidoptera: Saturniidae)

**Zusammenfassung:** Es wird eine Übersicht über die Taxa der Untergruppe von *Loepa damartisi* JORDAN, 1911 aus China gegeben. Für folgende vier Taxa werden **Lectotypen designiert** (alles Männchen): *L. katinka kuangtungensis* MELL, 1939 (in MAKB Bonn), *L. katinka septentrionalis* MELL, 1939 (in ZMHU Berlin) (diese beiden Taxa gehören zur *katinka*-Artengruppe), *L. miranda taipeishanis* MELL, 1939 (in MAKB Bonn), und *L. miranda septentrionalis* MELL, 1939 (in MAKB Bonn); alle vier Taxa werden auf Artrang gesehen (teilweise **stat. n.**). *L. miranda septentrionalis* und *L. katinka septentrionalis* sind **primäre Homonyme**. Auf der Basis der Entscheidung der ersten Revisoren wird *L. katinka septentrionalis* Vorrang eingeräumt. Als **Ersatzname** für *L. miranda*  $\dagger$ *septentrionalis* wird das subjektive jüngere Synonym *L. wlingana* YANG, 1978 vorgeschlagen. Auch *L. damartisi szechwana* ZHU & WANG, 1993 ist ein jüngeres subjektives Synonym von *L. wlingana* (**syn. n.**). Zwei weitere Arten aus dem Komplex werden als neu beschrieben: *L. elongata* **sp. n.**, Holotypus Männchen aus Sichuan (in ZMHU Ber-

lin), und *L. melli* **sp. n.**, Holotypus Männchen aus Gansu (in ZMHU Berlin). Alle Arten inklusive ihrer Holotypen beziehungsweise Lectotypen sowie ihre männlichen Genitalstrukturen werden abgebildet.

### Introduction

Some general notes on the genus *Loepa* MOORE, 1859 (for the correct publication date of the genus name, see NÄSSIG 2007) are given in a separate publication by NAUMANN & LÖFFLER (2012), published simultaneously in the same issue. A preliminary and tentatively phylogenetic grouping of the species was published by NAUMANN (1995: 82) which is still basically valid; the three species-groups of *L. oberthuri* (LEECH, 1890), *L. miranda* ATKINSON in MOORE, 1865 and *L. katinka* (WESTWOOD, 1848) were later again defined in more detail by YEN et al. (2000: 153). In this paper the *miranda*-group was divided into two subgroups, namely the *miranda*-subgroup which is distributed more to the South, and the *damartisi*-subgroup more to the North. A third, later identified subgroup of the *miranda*-group (the *yunnana*-subgroup) is subject of the paper by NAUMANN & LÖFFLER (2012).

The present work is dealing with the subgroup of *L. damartisi* JORDAN, 1911 (the oldest name in this subgroup), a well-defined species-complex within the *miranda*-group in which all taxa show a fused tip of the uncus in ♂ genitalia, and a paler yellowish ground colour, compared with other members of the genus. The species dealt with in this publication are defined by a relatively rounded, compact wing form both in ♂ and ♀ specimens (except of one species described as new below), relatively small wing ocelli, a greyish black antemedian line of the forewing with only small carmine or purple shadow on its costal end (again with one exception, *L. damartisi* itself), relative small male genitalia with less sclerotised parts, compared to other members of the *miranda*-group, and, in general, a main flight period in late summer and autumn which makes a hibernation as ovum plausible. All taxa (again with one exception) occur in lower mountainous areas, only one taxon is a typical representative of a high mountain fauna. All taxa are confined to China,

<sup>1</sup> The expressions “[species]-group” and, subordinate to this, “[species]-subgroup” (sometimes also “species-complex”) are used in this publication as tentative informal groupings of species which are deemed to be closely related to each other and supposedly form a monophyletic unit. However, these groupings are here not intended to be published for the purpose of zoological nomenclature (ICZN 1999: Art. 8.2.; disclaimer), and these collective group names, therefore, do not enter into the genus-group of names in zoology (ICZN 1999: Art. 10.3., 10.4.).

<sup>2</sup> 23rd contribution to the Saturniidae fauna of China (22nd contribution: S. NAUMANN & S. LÖFFLER [2012]: Taxonomic notes on the group of *Loepa miranda*, 1: The subgroup of *Loepa yunnana* (Lepidoptera: Saturniidae). – Nachrichten des Entomologischen Vereins Apollo, N.F. 33 (2/3): 57–68).

<sup>3</sup> 81st contribution to the knowledge of Saturniidae. (80th contribution: ROUGERIE, R., NAUMANN, S., & NÄSSIG, W. A. [2012]: Morphology and molecules reveal unexpected cryptic diversity in the enigmatic genus *Sinobirna* BRYK, 1944 (Lepidoptera: Saturniidae). – PLoS ONE, San Francisco, 7 (9): e43920 [doi:10.1371/journal.pone.0043920].)

with a focus on southwest China, and one taxon is even distributed as far northeast as Liaoning province, the most northern representative of the entire genus (map: Fig. 1).

During recent years legs of many populations of Palae-arctic and Asian Saturniidae were sent to the “Canadian Centre for DNA Barcoding” (CCDB) in Guelph, Ontario, for sequencing and analysing using the 658 base pairs (bp) of the barcode fragment of the mitochondrial cytochrome-*c* oxydase gene, subunit I (= mtDNA COI gene) (see RATNASINGHAM & HEBERT 2007; in the web: BARCODE OF LIFE 2012). DNA was extracted from the legs of dried specimens in the collections of the authors and others. Technical details of extraction and amplification and sequencing protocols can be found on the CCDB web-site (CCDB 2012) and are also described, e.g., in VAGLIA et al. (2008). Also within the resulting COI barcode sequences the species as well as species-subgroups and -groups are in most cases well-defined (see below in text and discussion). The specimens which were used for the mtDNA analysis and their data are listed in Table 1. The results of the barcode analysis applying the Maximum Likelihood method (MEGA5, TAMURA et al. 2011) are graphically displayed in Text-Fig. 1.

Within the species-subgroup of *L. damartisi*, five taxa have already been described before (in chronological order):

- *Loepa damartisi* JORDAN, 1911
- *Loepa miranda taipeishanisi* MELL, 1939
- *Loepa miranda septentrionalis* MELL, 1939
- *Loepa wlingana* YANG, 1978
- *Loepa damartisi szechwana* ZHU & WANG, 1993

In the present publication we describe two further species from China and give a review of the entire subgroup.

#### Abbreviations

BC	COI barcode number.
BMNH	The Natural History Museum, London, U.K.
CCAS	Collection of the Chinese Academy of Sciences, Beijing, PR China.
CMBS	Collection Martin BEEKE, Stemwede, Germany.
CMWM	Collection Museum WITT, München, Germany, assigned to ZSM.
CSLL	Collection Swen LÖFFLER, Lichtenstein/Sachsen, Germany.
CSNB	Collection Stefan NAUMANN, Berlin, Germany.
CWAN	Collection Wolfgang A. NÄSSIG, Frankfurt am Main, now in SMFL.
GP	Genitalia dissection number.
HT	Holotype.
LT	Lectotype.
MAKB	Museum Alexander Koenig, Bonn, Germany.
MHNL	Musé d'Histoire naturelle de Lyon, Lyon, France.
MNHN	Musée National d'Histoire Naturelle, Paris, France.
NHMW	Naturhistorisches Museum Wien, Austria.
PLT	Paralectotype.
PT	Paratype.
SMFL	Senckenberg-Museum, Collection of Lepidoptera, Frankfurt am Main, Germany.

ZMHU Zoologisches Museum der Humboldt-Universität, Berlin, Germany.

ZSM Zoologische Staatssammlungen München (Munich), Germany.

#### Taxonomic notes on the taxa described so far

(In chronological order of their description.)

##### *Loepa damartisi* JORDAN, 1911

The oldest taxon in the group is also the only one which easily can be separated from all other members by the completely carmine to violet pink antemedian line of the forewing, compared to a combination of carmine to dark violet with black in all other taxa. The identity of *L. damartisi* is well-defined also by its relative large size in combination with rounded wings.

**Type material:** The taxon was described after an unclear number of specimens for which no exact data are given in the original description. JORDAN just gave the origin as “Central and West China, in late summer”. Due to the confusion with closely related taxa, general superficial overall similarity of species of this genus, and to fix the type locality to a certain place, BRECHLIN & KITCHING (2010: 15) designated a male lectotype from the collections of the BMNH. This specimen is the only one in BMNH which prior to the designation was labelled as a syntype of *L. damartisi*. The lectotype is figured here from an actual digital picture taken in ix. 2012 in BMNH, still with the formerly attached syntype label and without LT label (Fig. 2). A tissue sample of this lectotype was sent from BMNH (via R. BRECHLIN, see BRECHLIN & KITCHING 2010) to the CCDB in Guelph, and there an incomplete COI mtDNA barcode sequence was achieved, which is also used here for comparison and to “root” the DNA systematics to the classical morphology-based concepts, just as well as the sequence data of the lectotype of *L. miranda* (also in BMNH), used here as outgroup.

**Locus typicus:** Not exactly given in JORDAN's description, cited there as “Zentral- und West-China, im Spätsommer [late summer]”; the type locality was later fixed as [PR China, Sichuan], S. Szechuen, Nanchuen, July–Sept., by designation of a lectotype by BRECHLIN & KITCHING (2010: 15). This place possibly corresponds to the present-day Nanchuan district of Chongqing.

#### Citations in literature:

*Loepa damartisi* JORDAN (1911: 214, fig. 32d ♂ [not 34d, as written in the text]); [COCKERELL in] PACKARD (1914: 163); SEITZ (1928: 506); BOUVIER & RIEL (1931: 49); ROEPKE (1953: 227); ZHU & WANG (1983: 411, pl. 133, fig. 2966 ♂ [misinterpretation, the figured specimen appears to be a ♂ of *L. kuangtungensis*]); WANG (1988: 460 [probably misinterpretation]; 1992: 801 [misinterpretation, the figured specimen appears to be a ♂ of *L. kuangtungensis*]); ZHU & WANG (1996: pl. VI, fig. 6 [see also below under misspelling “*L. damartisi*” for a further citation of that book] [misinterpretation; the figured ♂ is not a member of the *damartisi*-group at all, but more likely a ♂ specimen of *L. kuangtungensis*]); D'ABRERA (1998: 50, 51 fig. lower ♂ [no ♀, as indicated by D'ABRERA]); YEN et al. (2000: 153, 161); ROBINSON et al. (2001: 247; more likely this is a note regarding *L. kuangtungensis*, based on Chinese misidentifications); BRECHLIN & KITCHING (2010: 15, ♂ lectotype designated); BRECHLIN (2010: 30).

*Laepa* [sic] *Damartisi*: CONTE (1919: 200, pl. X, fig. 3 ♂).

*Loepa* [sic] *damartisi*: SCHÜSSLER (1933: 91; 1934: 600).

*Loepa katinka damartisi*: BOUVIER (1936: 233).

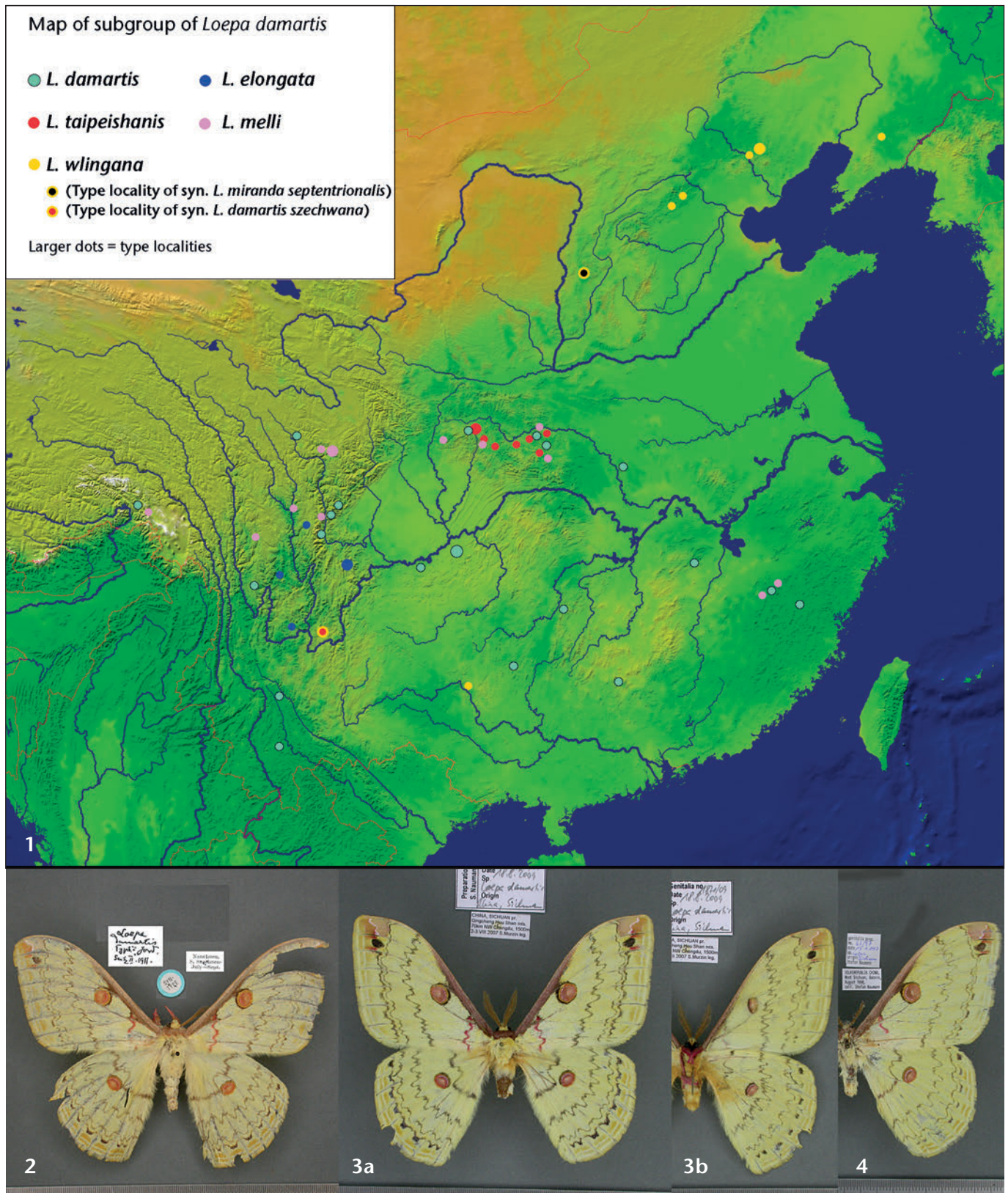
*Loepa* [sic] *damartisi*: YANG (1978: 439).

*Loepa damartisi* [sic]: ZHU & WANG (1993: 273, fig. 9 ♂ genitalia

**Table 1:** Data of the specimens used for the mtDNA sequence analyses. — Additional abbreviations: GBAC = GenBank Access Code; HT = holotype; LT = lectotype; PT = paratype; SL = Sequence Length (data from BoLD); — = GBAC not yet available.

Loepa species	Sample-ID	Process-ID	GBAC	SL	Sex	Deposition	Locality of origin
<i>L. damartisi</i> (LT)	SAT BMNH 0002	SANHM002-09	—	630[0n]bp	♂	BMNH	China, Sichuan
<i>L. damartisi</i>	SNB 3390	SASNC1401-12	—	658[0n]bp	♂	CSNB	China, Yunnan
<i>L. damartisi</i>	SNB 3391	SASNC1402-12	—	658[0n]bp	♀	CSLL	China, Sichuan
<i>L. damartisi</i>	SNB 3392	SASNC1403-12	—	658[0n]bp	♂	CSLL	China, Sichuan
<i>L. damartisi</i>	SNB 3388	SASNC1399-12	—	658[0n]bp	♀	CSLL	China, Sichuan
<i>L. damartisi</i>	SNB 0549	SASNA549-08	—	648[0n]bp	♂	CSNB	China, Sichuan
<i>L. damartisi</i>	SNB 0761	SASNA761-09	GU664308	658[0n]bp	♂	CSNB	China, Hunan
<i>L. damartisi</i>	SNB 0552	SASNA552-08	—	658[0n]bp	♂	CSNB	China, Fujian
<i>L. damartisi</i>	SNB 0762	SASNA762-09	GU664311	621[0n]bp	♂	CSNB	China, Yunnan
<i>L. damartisi</i>	SNB 3380	SASNC1391-12	—	658[0n]bp	♂	CSLL	China, Hubei
<i>L. damartisi</i>	SNB 3381	SASNC1392-12	—	658[0n]bp	♂	CSLL	China, Hubei
<i>L. damartisi</i>	SNB 3387	SASNC1398-12	—	633[0n]bp	♂	CSLL	China, Shaanxi
<i>L. damartisi</i>	SNB 0550	SASNA550-08	—	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. damartisi</i>	SNB 3383	SASNC1394-12	—	658[0n]bp	♂	CSLL	China, Yunnan
<i>L. damartisi</i>	SNB 3382	SASNC1393-12	—	658[0n]bp	♂	CSLL	China, Yunnan
<i>L. damartisi</i>	SNB 3385	SASNC1396-12	—	658[1n]bp	♂	CSLL	China, Fujian
<i>L. damartisi</i>	SNB 0548	SASNA548-08	—	658[0n]bp	♂	CSNB	China, Yunnan
<i>L. damartisi</i>	SNB 3386	SASNC1397-12	—	658[0n]bp	♂	CSLL	China, Guangdong
<i>L. damartisi</i>	SNB 2751	SASNC667-11	—	658[0n]bp	♂	CSNB	China, Guizhou
<i>L. damartisi</i>	SNB 2752	SASNC668-11	—	658[0n]bp	♂	CSNB	China, Guizhou
<i>L. taipeishanensis</i>	SNB 3398	SASNC1409-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 3396	SASNC1407-12	—	658[0n]bp	♂	CSLL	China, Hubei
<i>L. taipeishanensis</i>	SNB 0558	SASNA558-08	—	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 0770	SASNA770-09	GU664318	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 3400	SASNC1411-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 0765	SASNA765-09	GU664314	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 0767	SASNA767-09	GU664315	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 3402	SASNC1413-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 0769	SASNA769-09	GU664316	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 3403	SASNC1414-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. taipeishanensis</i>	SNB 3399	SASNC1410-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. wlingana</i>	SNB 0561	SASNA561-08	—	648[0n]bp	♂	CSNB	China, Hebei
<i>L. wlingana</i>	SNB 0560	SASNA560-08	—	632[0n]bp	♂	CSNB	China, Beijing
<i>L. wlingana</i>	SNB 0562	SASNA562-08	—	658[0n]bp	♂	CSNB	China, Liaoning
<i>L. wlingana</i>	SNB 3405	SASNC1416-12	—	658[0n]bp	♂	CSLL	China, Hebei
<i>L. wlingana</i>	SNB 3404	SASNC1415-12	—	658[0n]bp	♂	CSLL	China, Hebei
<i>L. wlingana</i>	SNB 0768	SASNA768-09	GU664317	658[0n]bp	♂	CSNB	China, Hebei
<i>L. wlingana</i>	SNB 3395	SASNC1406-12	—	658[0n]bp	♂	CSLL	China, Beijing
<i>L. wlingana</i>	SNB 3406	SASNC1417-12	—	658[0n]bp	♀	CSLL	China, Hebei
<i>L. wlingana</i>	SNB 4090	SASNC1721-12	—	658[0n]bp	♂	coll. Zou Y1	China, Beijing
<i>L. wlingana</i>	SNB 0771	SASNA771-09	GU664320	658[0n]bp	♂	CSNB	China, Liaoning
<i>L. wlingana</i>	SNB 0764	SASNA764-09	GU664312	658[0n]bp	♂	CSNB	China, Guangxi
<i>L. elongata</i> sp. n. (HT)	SNB 0553	SASNA553-08	—	658[0n]bp	♂	ex CSNB in ZMHU	China, Sichuan
<i>L. elongata</i> sp. n. (PT)	SNB 0554	SASNA554-08	—	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. elongata</i> sp. n. (PT)	SNB 0775	SASNA775-09	GU664322	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. elongata</i> sp. n. (PT)	SNB 2644	SASNC560-11	—	658[0n]bp	♂	CSLL	China, Sichuan
<i>L. elongata</i> sp. n. (PT)	SNB 2645	SASNC561-11	—	619[0n]bp	♂	CSLL	China, Sichuan
<i>L. elongata</i> sp. n. (PT)	SNB 2646	SASNC562-11	—	658[0n]bp	♂	CSLL	China, Yunnan
<i>L. melli</i> sp. n. (PT)	SNB 0559	SASNA559-08	—	658[0n]bp	♂	CSNB	China, Gansu
<i>L. melli</i> sp. n. (PT)	SNB 0763	SASNA763-09	GU664310	658[0n]bp	♂	CSNB	China, Gansu
<i>L. melli</i> sp. n. (PT)	SNB 3393	SASNC1404-12	—	658[0n]bp	♂	CSLL	China, Gansu
<i>L. melli</i> sp. n. (PT)	SNB 3394	SASNA1405-12	—	658[0n]bp	♂	CSLL	China, Gansu
<i>L. melli</i> sp. n. (PT)	SNB 0556	SASNA556-08	—	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. melli</i> sp. n. (PT)	SNB 0564	SASNA564-08	—	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. melli</i> sp. n. (PT)	SNB 0766	SASNA766-09	GU664313	658[0n]bp	♂	CSNB	China, Shaanxi
<i>L. melli</i> sp. n. (PT)	SNB 3401	SASNC1412-12	—	658[0n]bp	♂	CSLL	China, Shaanxi
<i>L. melli</i> sp. n. (PT)	SNB 3397	SASNC1408-12	—	658[0n]bp	♂	CSLL	China, Hubei
<i>L. melli</i> sp. n. (PT)	SNB 0557	SASNA557-08	—	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. melli</i> sp. n. (PT)	SNB 0760	SASNA760-09	GU664309	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. melli</i> sp. n. (PT)	SNB 0555	SASNA555-08	—	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. melli</i> sp. n. (PT)	SNB 3681	SASNC1597-12	—	658[0n]bp	♂	CSNB	China, Sichuan
<i>L. melli</i> sp. n. (PT)	SNB 0563	SASNA563-08	—	634[1n]bp	♂	CSNB	China, Jiangxi
<b>For comparison as outgroup</b>							
<i>L. miranda</i> (LT)	SAT-BMNH0001	SANHM001-09	—	553[89n]bp	♂	BMNH	India, [Himalaya]





**Fig. 1:** Map showing the partly sympatric distribution of the 5 species of the subgroup of *Loepa damartisi*. Type localities in bold symbols. — Map based on vegetation zone colours. Map created with Map Creator 2.0 Personal Edition, © 2003–2007 [www.primap.com/de/](http://www.primap.com/de/), modified and localities added. — **Figs. 2–47:** Specimens of *Loepa* species of the *damartisi* subgroup [always no letter or a = dorsal, b = ventral side, c = other details]; all localities in PR China. — **Figs. 2–4:** *L. damartisi*. **Fig. 2:** ♂ LT of *L. damartisi*, S. Sichuan, Nanchuen, vii.–ix., BMNH (© The Natural History Museum [BMNH], London). **Figs. 3a, b:** ♂, Sichuan, Qingcheng Hou Shan, 70 km NW Chengdu, 1500 m, vii. 2007, S. MURZIN leg., CSNB. **Fig. 4:** ♂, W. Sichuan, Baoxin, viii. 1996, CSNB. — Pictures of specimens approximately to the same scale, scale in cm with 0.5 mm subdivisions. Labels often reduced to greyscale and contrast enhanced for better legibility.

**Figs. 5–13:** *L. damartisi*. **Fig. 5:** ♂, SW Gansu, Danque, Duoershan, viii. 2005, Li et al. leg., CSNB. **Fig. 6:** ♂, E. Guizhou, Kaili env., Leigongshan, 1500 m, ix. 2001, Li leg., CSNB. **Fig. 7:** ♂, Hunan, Huaihua, Huangyuan Mt., 1200 m, ix. 2001, Li & WEN leg., CSNB. **Fig. 8:** ♂, N. Fujian, Bijiashan, Renshou, ix. 2002, Li et al. leg., CSNB. **Fig. 9:** ♂, Shaanxi, Lueyang, vii. 2010, E. KUČERA leg., CSNB. **Fig. 10:** ♂, Yunnan, Lanchang County, E Simao, Heishan, 2200–2400 m, ix. 1999, WANG & Li leg., CSNB. **Fig. 11:** ♂, Tibet, Linzhi County, Famudul, ca. 3000 m, vii. 2005, CSNB. **Figs. 12a, b:** ♀, Sichuan, Luzhou,





2000 m, VIII. 2008, ex CSLL, CSNB. **Fig. 13:** ♀, W. Shaanxi, Taibaishan, Yuhangshan, 1800 m, VIII. 2000, WANG leg., CSNB. — **Figs. 14–21:** *L. taipeishanis*. **Figs. 14:** ♂ LT of *L. miranda taipeishanis*, S. Shaanxi, Qinling Shan, Taibaishan, 1700 m, 10. VIII. 1936, H. HÖNE leg., GP 675/93 WAN, MAK. **Fig. 15a, b:** ♂, PLT of *L. miranda taipeishanis*, S. Shaanxi, Qinling Shan, Taibaishan, 1700 m, 28. VII. 1935, H. HÖNE leg., GP 905/03 SNB, MAK. **Fig. 16:** ♂, PLT of *L. miranda taipeishanis*, S. Shaanxi, Qinling Shan, Taibaishan, 1700 m, 27. VII. 1935, H. HÖNE leg., MAK. **Fig. 17a, b:** ♂, Shaanxi, Tsinling Mts., S Taibaishan, Houzhenzi village, 1600 m, 20. IX.–12. X. 1999, leg. V. SINIAEV & A. PLUTENKO, CSNB. **Fig. 18:** ♂, E. Shaanxi, Yuhangding, Shanguan, 1600 m, VIII. 2000, WANG leg., CSNB. **Figs. 19:** ♂, Shaanxi, Qinling Mts., Foping env., 1500 m, IX.–X. 2005, CSNB. **Fig. 20:** ♂, Hubei, Wudang Shan, 1500 m, VIII.–IX. 2000, CSLL. — Pictures of specimens approximately to the same scale, scale in cm with 0.5 mm subdivisions (phot. S.N.: grey scale), respectively 1.0 mm (phot. S.L.: brown scale and phot. W.A.N.: yellow scale).



[misinterpretation]); ZHU & WANG (1996: 125, fig. 92 ♂ genitalia [misinterpretation]); NAUMANN (2003: 164 [citation of the misspelling by ZHU & WANG 1993, 1996]); WANG (2004: 411 [misinterpretation]).

The taxa described by MELL (1939): *Loepa miranda taipeishanis* MELL, 1939, *L. miranda septentrionalis* MELL, 1939 and others

The taxa described by MELL in 1939 are the main reason for the confusion in the *damartisi*-group until today, as they never were figured (under the correct name applied to them by MELL); only syntypes were mentioned by MELL (no designation of holotypes), and further because he described in the same paper another taxon, *L. katinka septentrionalis*, which clearly is a primary homonym of *L. miranda septentrionalis*.

During preparation of this manuscript and further work on palaearctic Saturniidae we found most material of MELL's type series to be housed in MAKB, but also dispersed to the collections of ZMHU, BMNH and CMWM (compare also citation of MELL's 1939 work in NAUMANN 2003: 164 or NAUMANN & NÄSSIG 2010: 36, 49, 50). In many cases specimens are not labelled as syntypes properly, and at the same time the originally given number of specimens in the type series could not be verified – either we did not find all syntypes, or there were more specimens in museum collections than syntypes listed by MELL. In some cases MELL obviously worked with only a part of the existing material, and later further specimens with the same or different collecting data by HÖNE were added to the series which evidently were not seen beforehand by MELL when describing the taxa. That may be caused by a situation that perhaps just a fraction of the entire material was then already set and placed into drawers when he worked on it. Later, after his publication, the rest of the collecting results was, after setting, incorporated into the drawers of MAKB and/or ZMHU. Also, it might have been caused by the fact that MELL obviously mainly worked in China and Berlin during the preparation of his manuscript, but some or most of the material was in Bonn then and he had no complete access to all specimens at the time. In addition, there was an intense exchange of material during that time, so parts of the type series were dispersed into other collections, and perhaps some of the syntypes may still be rediscovered at other places.

To fix the unclear and often doubtful identities of 4 of the 5 continental Chinese *Loepa* taxa described by MELL (1939), we here provide an overview about the material found by us and designate lectotypes, although 2 of 4 taxa involved are no members of the *damartisi*-complex at all, but are more closely related to *L. katinka* WESTWOOD, 1848 and belong to that species-group. For the 5th continental taxon described by MELL (1939), *L. yunnana* MELL, 1939, already raised to specific rank by YEN et al. (2000: 161), a ♂ lectotype was then designated from the collections of MAKB by NAUMANN (2003: 164).

### *Loepa katinka kuangtungensis* MELL, 1939

This relatively small and intensively yellow species is widespread in all southern provinces of China, but not on Taiwan where it is replaced by *L. formosensis* MELL, 1939 (synonym: *formosibia* BRYK, 1944; this synonymy probably first supposed by ROEPKE 1953: 227, then published by OWADA & WANG 1992: 205, note 31; see also YEN et al. 2000: 154). It is of dark yellow colour, intensively marked, typical are the broad pinkish red forewing antemedian line which ends towards the costal margin with outer grey margin, and the dark grey hindwing antemedian line which ends in male specimens with a pink patch at the anal margin. The eyespots are of medium to large size, those of the forewing sometimes have a costal "eyelid" (compare, e.g., the photo of a ♀ in ZHAO & LI 2005, mentioned there as "*L. anthera* JORDAN, 1911"). In ♂ genitalia the uncus is bifid at its tip, and so it is clearly a member of the *katinka*-group (NAUMANN 1995: 82), and the internal crest (or inner process) of the valves is (typical for most species of the *katinka*-group) short and knob-like, not an elongate crest as usual for most species of the *miranda*-group (Figs. 76–78; compare also genitalia figures in ZHU & WANG 1993: 273, figs. 9a, b, or 1996: 125, fig. 92). All notes on *L. damartisi* (and its misspelling "*damartisi*") and those on "*L. anthera*" in recent Chinese literature in fact refer to *L. kuangtungensis*, probably based on the misinterpretation by ZHU & WANG (1983), and then perpetuated again and again. *L. kuangtungensis* was raised to specific status by NAUMANN (1998: 52, 54).

**Type material:** The taxon *kuangtungensis* MELL, 1939 was described based on a series of 62 ♂♂ and 74 ♀♀, but MELL gave no collecting or rearing data and mentioned the origin of the material as "Nordkwangtung (alle Bergwaldgebiete, typ. Lokalität: Tshayuenshan), auch Süd- und Mittelhunan [translated: N Guangdong (all mountainous forest areas, typical locality: Tshayuenshan), also S and C Hunan]". We have not located the complete original type series, mainly due to the facts mentioned above. We found material which definitely can be assigned to the original series indicated by the handwritten determination and type labels of MELL in the collections of MAKB and ZMHU, but the material appears to be in part dispersed into other collections or could even have been in part destroyed during World War II. In MAKB we found in total 6 ♂♂ and 2 ♀♀ of potential syntypes, all with printed labels "Hoeng-Shan (900 m), Provinz Hunan, China, coll. HÖNE" with different dates (♂♂ with data: 2× 22. iv. 1933, 3. v. 1933, 18. v. 1933, 30. viii. 1933, 1. ix. 1933; ♀♀ with data: 27. iv. 1933, 13. v. 1933) on pink cardboard. Two ♂♂ bear genitalia labels with numbers 1331/00 NÄSSIG and 904/03 NAUMANN, and the latter has also a handwritten label by MELL with text "*L. kat. kuangtungensis* MELL, Paratype". Thereby it is obvious that material from this locality was included into the type series. The latter ♂ with data 18. v. 1933, genitalia no. 904/03 NAUMANN, is herewith designated as lectotype of *L. katinka kuangtungensis* (Figs. 48a, b), in order to fix the identity of the taxon with a locality in Hunan province. A red lectotype label will be added accordingly.

There are several further specimens determined as *L. katinka kuangtungensis*, partly by handwritten labels of MELL, and partly due to the fact that they have same locality labels but no determination label, but these originate either

from Li-kiang, W Yunnan Province, or from Kuatun, Fujian Province [mentioned as Fukien on the HÖNE label], or from E Tien-Mu-Shan, Lingan or Mokanshan, both in Chekiang Province. All of them are not part of the type series. On the other side we could not locate any MELL material from the locality Tshayuenshan in Guangdong Province which was mentioned in the original description.

In the general collection in ZMHU are 8 ♂♂ and 17 ♀♀ specimens which we accept to be paralectotypes, as they can be identified by the typical large handwritten MELL label; 2 ♂♂ and 4 ♀♀ have data “China, VIII. 1912, Tong-cung-san, MELL S.V.”, the rest has no locality data but has labels with illegible Chinese letters, partly with additional collecting date, attached. 2 ♂♂ have additional genitalia label with nos. 004- and 005-1999 ZMB, and one dried preparation without number is fixed to another ♂ specimen. To all those specimens we will add blue paralectotype labels. In the MELL collection kept separately in ZMHU there is a box with further 6 ♂♂ and 4 ♀♀ specimens, with a handwritten heading label in typical MELL style in the box “*L. k. kuangtungensis* MELL Typ. u. Paratyp.”, and all those specimens have no locality data and obviously resulted from a rearing by MELL, perhaps still during his time in China. There are additional heading labels in the box for a group of specimens each. Label for 1 ♀: “überw. Gen., III.-IV. [overwintered generation, March–April]”; 2 ♂♂, 1 ♀: “2. Gen. VI., Nachkommen von ♀ [followed by illegible handwritten note in MELL’s handwriting; 2nd generation, June, offspring of ♀ ...]”; and finally 4 ♂♂, 2 ♀♀: “2.-3. Gen., followed by something illegible, handwritten by MELL, and 4. VII.-10. IX. [2.-3. generation, ..., 4. VII.-10. IX.]”; two pairs of the latter ones are labelled separately as “VIII.”, the remaining two ♂♂ as “IX.”. Thereby it becomes clear that those specimens are probably not the complete series MELL had in his hands. Perhaps the complete box was a part of MELL’s “working collection” which was brought only to the museum after his death in the year 1970 and shows the improper labelling by MELL. The rearing experiments explain also the unusual ratio of ♂♂ to ♀♀. We accept also those 10 specimens in the MELL collection as paralectotypes, which will be indicated by blue labels as well.

**Locus typicus:** By designation of a lectotype the type locality of *L. katinka kuangtungensis* becomes PR China, Hunan Province, Hoeng Shan, 900 m. The locality would be named today as PR China, Hunan Prov., Heng Shan, near Hengyang, a mountain at geographical coordinates 27°16' N, 112°35' E (SCHINTLMEISTER 1992: 210).

#### Citation in literature:

*Loepa katinka kuangtungensis* MELL (1939: 151).

*Loepa katinka kuantungensis* [sic]: ROEPKE (1953: 227).

*Loepa kuangtungensis*: NAUMANN (1995: 82; 1998: 52, 54); YEN et al. (2000: 161); BRECHLIN (2010: 30); WANG & KISHIDA (2011: 148, pl. 53, fig. 3 ♂ [with misspelling *kunagtungensis* in plate legend]).

*Loepa damartisi*: ZHU & WANG (1983: 411, pl. 133, fig. 2966 ♂ [misinterpretation]).

*Loepa damaritisi* [sic, misspelling]: ZHU & WANG (1993: 273, fig. 9a, b [misinterpretation]; 1996: 125, fig. 92, pl. VI, fig. 6 ♂ [misinterpretation]).

*Loepa anthera*: ZHU & WANG (1983: 411, pl. 133, fig. 2965 ♀ [misinterpretation]; 1996: 125, fig. 91, pl. VI, fig. 5 ♀ [misinterpretation]); ZHAO & LI (2005: 152, fig. ♀ [misinterpretation]).

#### *Loepa katinka septentrionalis* MELL, 1939

This taxon is a close relative of *L. kuangtungensis* and replaces it in the mountainous areas of Shaanxi, Gansu and partly in northern Sichuan and Yunnan provinces.

On average it is a little larger, has smaller eyespots, and is less intensively marked. In ♂ genitalia the uncus is bifid as in *L. kuangtungensis*, but valves are on average a little more elongate, and the internal crest (or inner process) is not knob-like, but more acute at its ventral end, and has a longer costa to the apical part of the valve apex (Figs. 79–81). Most probably the information on “*L. anthera*” in ZHU & WANG (1993: 272, 1996: 125) refers to *L. septentrionalis*, but this is not absolutely sure (in 1996: pl. VI, fig. 5 they obviously figure a ♀ of *L. kuangtungensis* under that name). Due to the obvious and stable differences to *L. kuangtungensis* we interpret *L. septentrionalis* stat. n. here as a separate species within the *katinka*-group of species and formally raise it to species level (a lectotype is designated below). Already MELL (1939: 151) mentioned the morphological differences to *L. kuangtungensis*; his name refers to the more northern distribution, compared to the latter species, although not explicitly stated in the original description. We also figure one recently collected pair from Shaanxi, to show the differences to *L. kuangtungensis* (Figs. 50–51).

MELL (1939) also described another *Loepa* taxon under the identical subspecific name [*L. miranda*] *septentrionalis* which thereby is a primary homonym; the further dealing with this most unfortunate error of MELL see below under this taxon.

**Type material:** *Loepa katinka septentrionalis* was described after a series of 19 ♂♂ syntypes from Taibai Shan, southern Shaanxi Province, at altitudes of around 1700 m. Similar to the situation with *L. kuangtungensis*, it was impossible to locate the complete original type series, for similar reasons as mentioned above. In total, we found 7 ♂♂ syntypes in the collections of MAKB and ZMHU, which can definitely be assigned to the type series, partly from handwritten determination and type labels by MELL, and the rest by similar locality data labels.

There are in total 5 specimens in MAKB of which 3 have a red cardboard label reading “Tapeishan im Tsinling, Sued-Shensi [Shaanxi Prov.] (China), 21. VI. 1935, 22. VI. 1935” and “3. VII. 1935, H. HÖNE”, plus additional genitalia label “GP 1329/00 W. A. NÄSSIG” respectively “GP 1332/00 W. A. NÄSSIG”, plus one bearing a part of the former envelope with date “22. VI. 1935” stamped on it. The specimen dated 21. VI. 1935 has a small cardboard box attached with dried genitalia structures dissected probably by MELL himself; the structures are no longer determinable and very broken. A handwritten MELL label reading “*Loepa kat. septentrionalis* MELL Typ o. Parat.” is attached to that specimen. The 2 other specimens have a similar red label reading “Tapeishan im Tsinling, Sued-Shensi [Shaanxi Prov.], ca. 1700 m, 22. v. 1936” and “17. VI. 1936, H. HÖNE”; the specimen dated 22. v. 1936 bears 2 additional handwritten labels reading “*L. katinka* spp. *septentrionalis* MELL” [most probably not written by MELL himself] and “GP 1335/00 W. A. NÄSSIG”.

In ZMHU we found in the MELL collection 2 specimens from the type locality; one has the same red cardboard locality label reading “Tapeishan im Tsinling, Sued-Shensi (China), ♂, 17. v. 1936, H. HÖNE”, a separate date label “17. May 1936”, cut from its former envelope, and a blue genitalia label reading “GU-Nr. 002-1999 ZMB”. It has a forewing length of 46 mm. We hereby designate this specimen as lectotype of *L. katinka septentrionalis* (Figs. 49a, b, 78), in order to fix the identity of that taxon, especially in comparison and in



contrast to *L. kuangtungensis*. We will add a red lectotype label accordingly. The second specimen in ZMHU bears a similar locality label with date 29. vi. 1935 imprinted, a separate date label “29. June 1935” cut from the envelope, and a blue genitalia label “GU-Nr. 001-1999 ZMB” (Fig. 80). It also has a handwritten MELL label “*L. katinka septentrionalis* MELL, 2 Parat.” attached, which probably was a header in this ZMHU box for the two specimens formerly.

We will add blue paralectotype labels to the remaining 6 paralectotypes.

**Locus typicus:** As given in the original description, the type locality is “Südshensi, Tapeishan, around 1700 m”. The locality would be listed today as PR China, Shaanxi Prov., Qingling Mts., Taibai Shan. The Taibai Shan is the highest peak of the Qingling Mts., with a summit elevation of over 4000 m, but the collecting site was somewhere at much lower elevations, perhaps at the historic collecting site of Lototse village which is about at 1700 m altitude (SCHINTLMEISTER 1992: 213).

#### Citation in literature:

*Loepa katinka septentrionalis* MELL (1939: 151); ROEPKE (1953: 227); BRECHLIN (2010: 30; cited with unclear status [synonym of *L. kuangtungensis*?]).

### *Loepa miranda taipeishanis* MELL, 1939

This is one of three very small *Loepa* species within the complex of *L. damartisi*, confined to a distribution in mountains of central and eastern Shaanxi and nearby northern Hubei provinces. It is of light whitish yellow colour, the antemedian line is narrow and grey, ending in about half of the specimens on the forewing costa with a proximal carmine shadow. The postmedian and submarginal lines are slightly indicated, in some specimens almost completely reduced. Antennae of fresh specimens often are of green colour and fade later to ochreous brown in most cases, as already mentioned by MELL (1938: 152). Male genitalia show a fused uncus, and the internal crest (or inner process) of the valves is almost a straight structure without any larger protuberances. With respect to the mtDNA COI barcode, the taxon *taipeishanis* forms a weakly defined cluster within the resulting MP tree, with only less than 1% difference to the most closely related taxon, *L. wlingana* YANG, 1978, which forms a much more homogenous cluster for itself (Text-Fig. 1). Due to stabile and reproducible morphological differences we hereby raise *L. taipeishanis* **stat. n.** to species level. According to the different forewing antemedian band it clearly is no subspecies of *L. miranda* at all.

**Type material:** *L. miranda taipeishanis* was described after a series of 8 ♂♂; a type locality was not mentioned in the original description, but, self-explanatory from the name, it is clear that the taxon was named after its origin “Tapeishan” [PR China, Shaanxi, Taibai Shan]. In total, we located 53 ♂♂ in MAKB which could be possible syntypes, all with relatively similar collecting data printed on red cardboard labels reading “Tapeishan im Tsinling, Sued-Shensi (China), H. HÖNE” [with different dates in 1935] and “Tapeishan im Tsinling, Sued-Shensi, ca. 1700 m, H. HÖNE” [with different dates in 1936]; only 2 of them bear a handwritten MELL label reading “*L. miranda taipeishanis* MELL Typ o. Parat.”, and so it is not clear which of the other specimens were in hands of MELL during his descriptive work. Similar to the situation with *L. kuangtungensis*, it is not clear to which of

those specimens MELL referred in his description, and without designation of a lectotype the identity of that taxon would remain somehow dubious (there occurs a second very similar species in Shaanxi, see below). Thereby we herewith designate as lectotype of *L. miranda taipeishanis* (Fig. 14) a ♂ with data “Tapeishan im Tsinling, Sued-Shensi, ca. 1700 m, 10. VIII. 1936, H. HÖNE” and additional genitalia label “GP 675/93 W. A. NÄSSIG” from MAKB; a red lectotype label will be added accordingly.

From the rest of the material we separate 7 further ♂♂ as paralectotypes; they have following data: 3 ♂♂, 2. VIII. 1935, 2 of them with the mentioned paratype labels handwritten by MELL; 1 ♂, 27. VII. 1935; 1 ♂ 28. VII. 1935, almost completely without markings on its wings (Fig. 15); and 2 ♂♂, VIII. 1936. They are separated from the rest of the material, and blue paralectotype labels will be added accordingly.

**Locus typicus:** Not explicitly mentioned in the original description, but from the name it is clear that the taxon originates from “Tapeishan”. By designation of the lectotype the type locality gets fixed as “Tapeishan im Tsinling, Sued-Shensi, 1700 m” [= PR China, Shaanxi Prov., Qingling Mts., Taibai Shan, 1700 m]. See also notes on the type locality under *L. katinka septentrionalis* above.

#### Citation in literature:

*Loepa miranda taipeishanis* MELL (1939: 152); ROEPKE (1953: 227).

*Loepa miranda taipeishanis* [sic]: ROEPKE (1953: 227).

*Loepa taipeishanis*: BRECHLIN & KITCHING (2010: 16, checklist [and genitalia illustration fig. 16]; not explicitly raised in status); BRECHLIN (2010: 30, checklist; not explicitly raised in status).

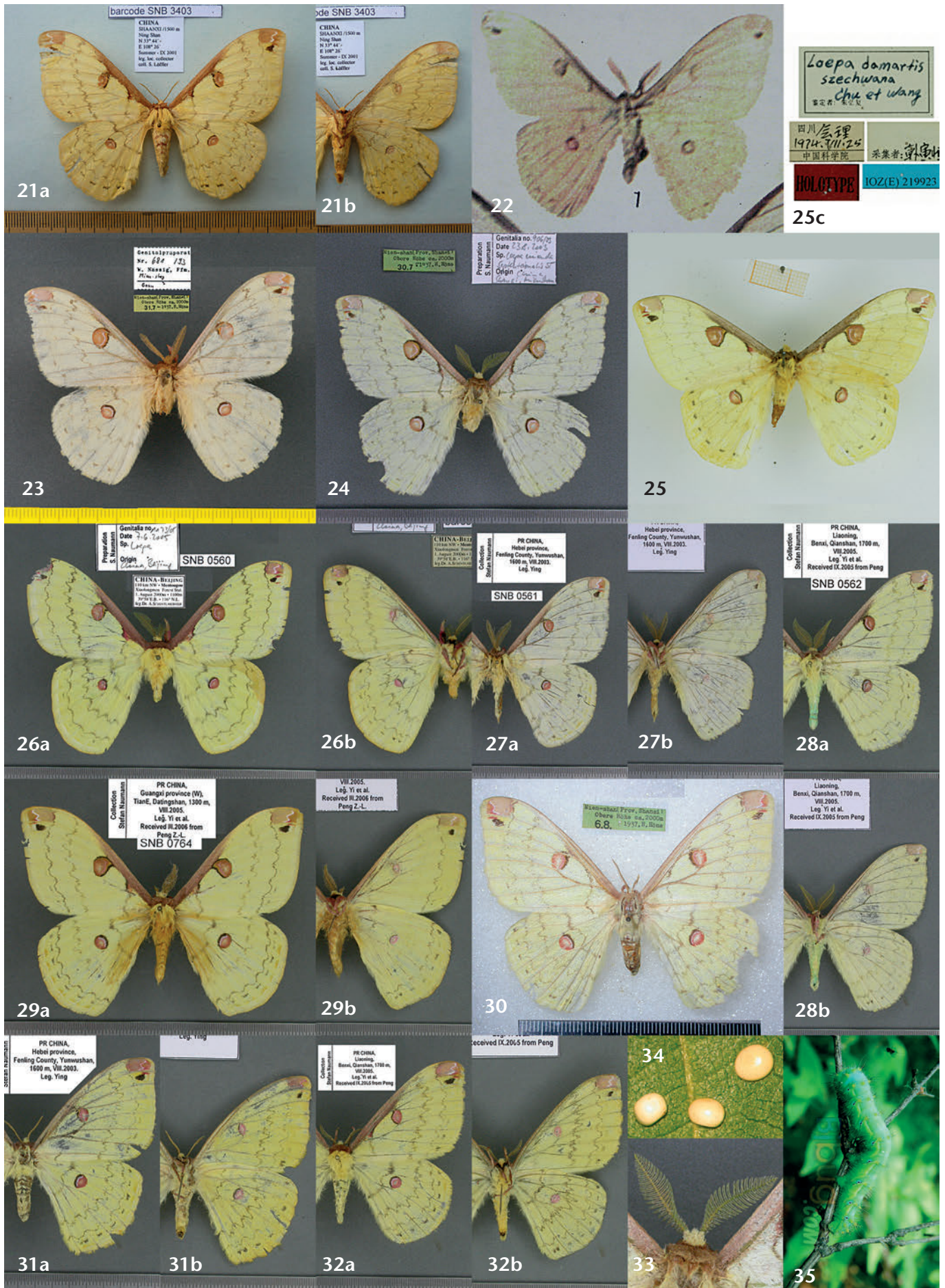
*Loepa miranda* [error in determination]: D'ABRERA (1998: 51, fig. upper ♂).

### *Loepa miranda* $\nabla$ *septentrionalis* MELL, 1939

This taxon probably is the closest relative of *L. taipeishanis*, occurring in most provinces of northeastern China. It is the smallest of all three taxa within the complex of whitish yellow *Loepa* species of the *damartisi*-subgroup, also shows the thin grey antemedian line, ending in all ♂♂ and ♀♀ specimens on the forewing costa with a tiny proximal carmine shadow. The ornamentation is some-

**Figs. 14–21:** *L. taipeishanis*. — **Figs. 21a, b:** ♀, Shaanxi, Ning Shan, 1500 m, summer–ix. 2001, CSLL. — **Figs. 22–35:** *L. wlingana*. **Fig. 22:** ♂ HT of *L. wlingana*, reproduction of the very poor figure in the original description. **Figs. 23a, b:** ♂ LT of *L. miranda*  $\nabla$ *septentrionalis*, Shanxi, Mien Shan, obere Höhe, ca. 2000 m, 31. VII. 1937, H. HÖNE leg., GP 681/93 WAN, MAKB. **Fig. 24:** ♂ PLT of *L. miranda*  $\nabla$ *septentrionalis*, Shanxi, Mien Shan, obere Höhe, ca. 2000 m, 30. VII. 1937, H. HÖNE leg., GP 906/03 SNB, MAKB. **Fig. 25:** ♂ HT of *L. damartisi szechwana*, Sichuan, Huili, VII. 1974, HAN Yinheng leg., CCAS. **Fig. 25c:** Labels of the HT of *L. damartisi szechwana*, CCAS. **Figs. 26a, b:** ♂, Beijing, 110 km NW Mentougou, Xiaolongmen Forest Station, 1100 m, VIII. 2000, A. SCHINTLMEISTER leg., CSNB. **Figs. 27a, b:** ♂, Hebei, Fengling County, Yunwushan, 1600 m, VIII. 2003, YING leg., CSNB. **Figs. 28a, b:** ♂, Liaoning, Benxi, Qiangshan, 1700 m, VIII. 2005, Yi et al. leg., CSNB. **Figs. 29a, b:** ♂, W. Guangxi, Tian E, Datingshan, 1300 m, VIII. 2005, Yi et al. leg., CSNB. **Fig. 30:** ♀, Shanxi, Mien Shan, obere Höhe, ca. 2000 m, 6. VIII. 1937, H. HÖNE leg., MAKB. **Figs. 31a, b:** ♀, Hebei, Fengling County, Yunwushan, 1600 m, VIII. 2003, YING leg., CSNB. **Figs. 32a, b:** ♀, Liaoning, Benxi, Qiangshan, 1700 m, VIII. 2005, Yi et al. leg., CSNB. **Fig. 33:** Antennae of ♂ PLT of *L. miranda*  $\nabla$ *septentrionalis*, MAKB (see Fig. 24). **Fig. 34:** *L. wlingana*, ova deposited by wild collected ♀, Hebei, VIII. 2003. **Fig. 35:** *L. wlingana*, larva (with 2 tachinid eggs), Song Shan Natural Reserve, NW Beijing, 2006, photo by courtesy of Li Kai. — Pictures of specimens approximately to the same scale, scale in cm with 0.5 mm subdivisions (phot. S.N.: grey scale), respectively 1.0 mm (phot. S.N.: black scale, phot. S.L.: brown scale, and phot. W.A.N.: yellow scale).







what more intense compared to *L. taipeishanis*, and the ♂ forewing ocelli are somewhat larger, in almost all cases with a small lid-like pattern connecting the ocellus to the costa. Antennae of fresh specimens often are also of green colour (see detail in Fig. 33) and later fade to ochreous brown in most cases, as already mentioned by MELL (1938: 152); also ♂ abdomina often fade to some sort of greenish colour if they get greasy. ♂ genitalia similar to *L. taipeishanis*, the saccus a little wider, and the internal crest (or inner process) of the valves with a dorsal knob-like protuberance.

This taxon would have to be raised to specific status, but due to a primary homonymy with *L. katinka septentrionalis*, already dealt with above, the name is unavailable (ICZN 1999, Art. 57.2). As both taxa were described in the same publication and both at identical subspecific level, we herewith decide in accordance with the *principle of the first revising authors* (ICZN 1999, Art. 24.2) that *L. katinka septentrionalis* should have preference over *L. miranda septentrionalis*. With this situation, it becomes necessary to replace the latter name by a replacement name; the next available synonym of *L. miranda septentrionalis* is *L. wlingana* YANG, 1978 (ICZN 1999: Art. 60.2) which is now to be used as the valid name for the species, see below.

**Type material:** *L. miranda septentrionalis* was described after a series of 6 ♂♂ syntypes originating from “Shansi (Mienshan)”, without notification of further data. In MAKB we located a series of 10 ♂♂ and 1 ♀ with same locality data “Mien-Shan (Prov. Shansi), obere Höhe ca. 2000 m, H. HÖNE”, collected at different dates in VII. and VIII. 1937. These data are printed on green cardboard labels. 1 ♂, dated 29. VII. 1937, has a handwritten MELL label reading “*L. mir. septentrionalis* MELL Typus”, and 3 ♂♂, collected 31. VII., 1. VIII. and 4. VIII. 1937, are indicated as paratypes with a label in same style; all other specimens are not indicated as types at all. Due to the situation of MELL’s description it is clear that only a syntype series exists, as no holotype was chosen in the paper. To fix the status of the taxon, we herewith designate as lectotype of *L. miranda septentrionalis* a ♂ with collecting date 31. VII. 1937 and additional genitalia label “GP 681/93 W. A. NÄSSIG” (Figs. 23a, b); a red lectotype label will be added accordingly. From the rest of the material we separate as paralectotypes the 4 ♂♂ with MELL’s type labels mentioned above plus one further ♂ with collecting date 30. VII. 1937 and additional genitalia label “GP 906/03 NAUMANN” (Fig. 24). The rest of the existing material is no part of the type series. There even exists one ♀ from the type locality, collected 6. VIII. 1937 (Fig. 30), which never was mentioned by MELL.

**Locus typicus:** As given by MELL in the original description, the type locality of *L. miranda septentrionalis* is “Mien-shan, Shansi”. It would be named as Mian Shan [= Jie Shan], Shanxi prov., PR China, today. SCHINTLMEISTER (1992: 211) rendered the locality more precisely as “ca. 37° N, 112° E, a locality at the western slopes of the mountain range, southeast of the railway station Kiaishui” [which would be named today as Huajiyao].

#### Citation in literature:

*Loepa miranda septentrionalis* MELL (1939: 152); ROEPKE (1953: 227); BRECHLIN & KITCHING (2010: 15; cited as synonym of *L. miranda*, and indicated as homonym); BRECHLIN (2010: 30; cited as synonym of *L. miranda*).

#### *Loepa wlingana* YANG, 1978

*L. wlingana* is a younger subjective synonym of *L. miranda septentrionalis*, but, as mentioned above, the latter is a primary homonym of *L. katinka septentrionalis*, and thereby *L. wlingana* becomes the valid available replacement name of this *Loepa* species (ICZN 1999: Art. 60.2) occurring most northerly within the genus. Although the figure of the ♂ holotype in the descriptive work is somewhat diffuse and we could not yet examine the specimen personally, the identity of the taxon is clear by its description and due to the situation that only one *Loepa* species occurs so far northerly.

Due to the constant character differences mentioned already under *L. miranda septentrionalis* and differences to its closest relative, *L. taipeishanis*, we deal with *L. wlingana* on full species level. Also the differences and bootstrap values of the barcode analysis support this status (see discussion and Text-Fig. 1).

**Type material:** *L. wlingana* was described after one ♂ with following data given in the original description: PR China, Hebei Prov., Xinglong, Wuling Mountains, 1700 m, 23. VIII. 1973, at light, leg. YANG Jikun [in Chinese letters]. This specimen is a holotype by monotypy. It is believed to be held in the collections of China Agricultural University (formerly named Beijing Agricultural University, as written on the front cover of the publication by YANG 1978) in Beijing, but could not be located and examined so far. The HT is figured here as reproduction of the very poor illustration in the original description (Fig. 22).

**Locus typicus:** As given in the description, it is PR China, Hebei Prov., Xinglong, Wuling Mountains [= Wuling Shan], 1700 m. This locality is northeast of the capital Beijing, at about 40°42' N, 117°30' E.

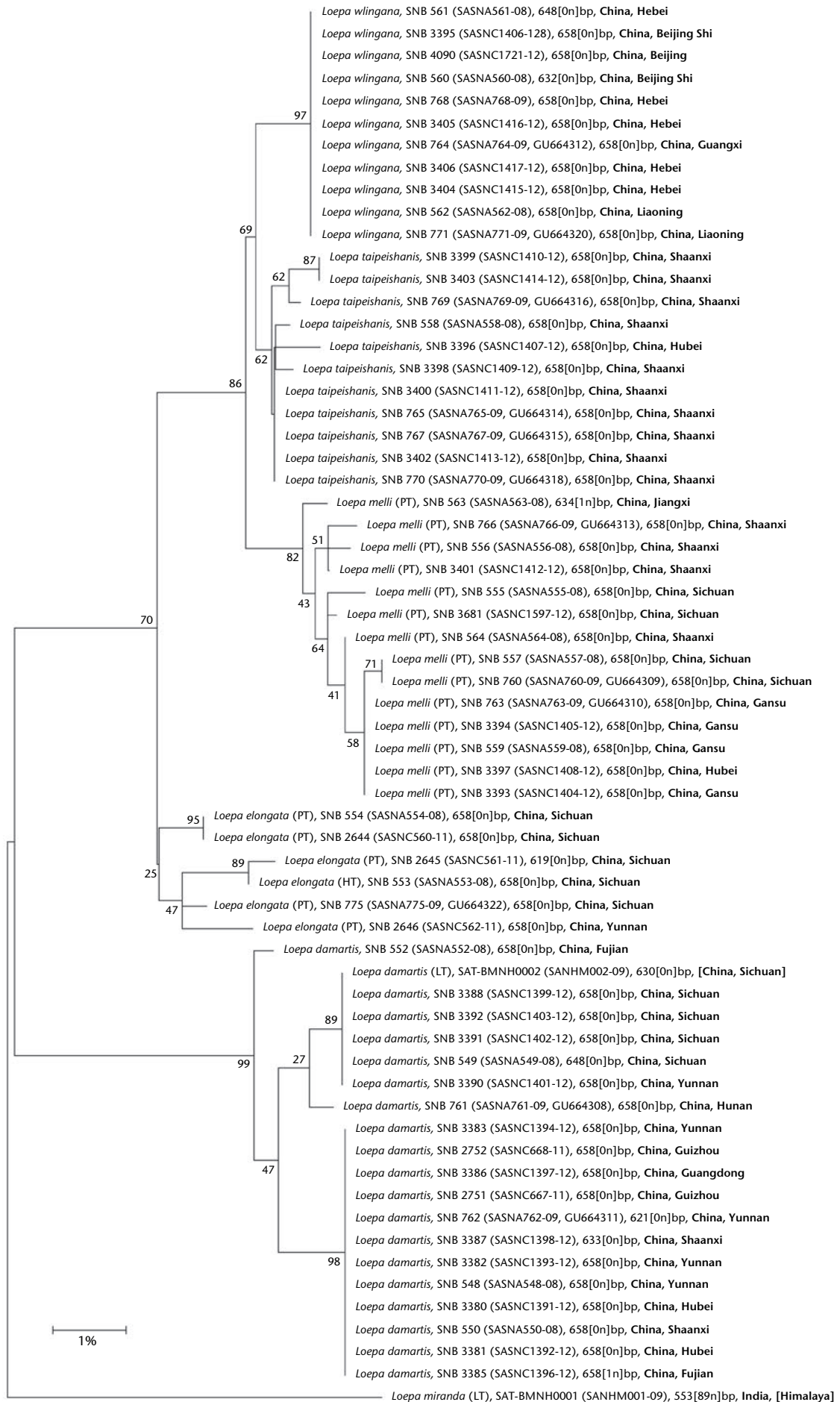
#### Citation in literature:

*Loepa* [sic] *wlingana* YANG (1978: 439, pl. 27, fig. 1 ♂ HT).

*Loepa wlingana*: D’ABRERA (1998: 50, with wrong citation of description); BRECHLIN & KITCHING (2010: 16 [cited as possible synonym or subspecies of *L. taipeishanis*]); BRECHLIN (2010: 30; cited with unclear status [possible synonym or subspecies of *L. taipeishanis*?]).

**Text-Fig. 1:** Molecular Phylogenetic analysis by Maximum Likelihood method conducted in MEGA5 (TAMURA et al. 2011). The analysis involved 63 nucleotide sequences (= specimens). Codon positions included were 1st+2nd+3rd+Noncoding. All positions containing gaps and missing data were eliminated. There were a total of 423 positions in the final dataset. The evolutionary history was inferred by using the Maximum Likelihood method based on the Data specific model (NEI & KUMAR 2000). The bootstrap consensus tree inferred from 1000 replicates is taken to represent the evolutionary history of the taxa analyzed (FELSENSTEIN 1985). Branches corresponding to partitions reproduced in less than 50% bootstrap replicates are collapsed. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (1000 replicates) are shown next to the branches (FELSENSTEIN 1985). Initial tree(s) for the heuristic search were obtained automatically as follows. When the number of common sites was < 100 or less than one fourth of the total number of sites, the maximum parsimony method was used; otherwise BIONJ method with MCL distance matrix was used. A discrete Gamma distribution was used to model evolutionary rate differences among sites (5 categories [+ G, parameter = 0.3683]). The rate variation model allowed for some sites to be evolutionarily invariable (+ I, 53.5501% sites). The tree is drawn to scale, with branch lengths measured in the number of substitutions per site. — We also tested the data set when all data with less than 658 bp were eliminated before MEGA5 was used; however, this did not improve the structure of the “weak” clusters. Other methods offered by MEGA5 resulted in similar to identical tree topologies.





Text-Fig. 1

### *Loepa damartisi szechwana* ZHU & WANG, 1993

The identity of this taxon was somewhat uncertain so far, as in the original description only the ♂ genitalia were figured, which of course clearly belong to a species of the *miranda*-group (NAUMANN 1995: 82) due to their fused uncus, but not the HT specimen itself. In the description it is compared with what ZHU & WANG (1993, followed by most other Chinese publications since then) interpreted as *L. damartisi*, but which is a different *Loepa* species (most probably *L. kuangtungensis*) which definitely does not belong to the *miranda*-group at all, but is a member of the species-group of *L. katinka*, according to the ♂ genitalia structures figured (ZHU & WANG 1993: fig. 9; 1996: fig. 92) which show a bifid uncus. Alone from the ♂ genitalia figure the identity cannot be determined safely, especially as this is a drawing and not a photo. An additional problem is that ZHU & WANG (1996: pl. VII, fig. 1) figure a ♂ under the name *L. damartisi szechwana* [sic] which is not identical with the specimen held as “holotype” in the collection of the Chinese Academy of Sciences; this “holotype” has a different collecting date provided on its label (25. VII. 1974) than the date given in the original description (3. VIII. 1981). As the specimen in Beijing is labelled very careful and in a similar manner as all other type specimens described by ZHU & WANG, we believe that this, nevertheless, is the “real” holotype and perhaps the date was somehow confounded in the publication by ZHU & WANG (1993). The specimen figured in 1996 could not be located in the collections of the Chinese Academy of Sciences yet.

Although *L. damartisi szechwana* was described from Sichuan far south of the main distribution area we believe it to be conspecific with *L. wlingana* which has the same size, the same form of the ocelli, especially the lid-like connection of the forewing ocellus with the costa, and similar ♂ genitalia.

There is another southern specimen (Figs. 29a, b), from Guangxi, in CSNB for which the examination of its external and genitalia morphology as well as the barcoding results (Text-Fig. 1) showed conspecificity with the specimens of *L. wlingana* originating from the northern Hebei, Beijing, and Liaoning provinces, a fact which indicates that there indeed exist small populations of that species much further south from its main distribution area in the north. Thereby *L. damartisi szechwana* **syn. n.** sinks into synonymy of *L. wlingana*; this synonymy was already listed by BRECHLIN & KITCHING (2010: 16) and BRECHLIN (2010: 30), but not indicated as a new synonym there.

**Type material:** *L. damartisi szechwana* was described after a single ♂ (Fig. 25) bearing following data label [in Chinese letters] (Fig. 25c): “*Loepa damartisi szechwana* ZHU & WANG; det. ZHU Hongfu”; “Sichuan, Huili, 25. VII. 1974; Chinese Academy of Sciences”; “Collector: HAN Yinheng”; “HOLOTYPE”; and “IOZ(E)219923”. The photo was kindly taken and the label text was translated by XUE Dayong of the Chinese Academy of Sciences, Beijing, in which collection the HT is deposited.

**Locus typicus:** The type locality is given by the label text of the HT which is PR China, Sichuan, Huili. This locality in the south of Sichuan province is located in the Liang Shan at ca. 26°39'18" N, 102°14'25" E at an altitude of ca. 1800 m.

#### Citation in literature:

*Loepa damartisi* [sic] *szechwana* ZHU & WANG (1993: 274, fig. 10 ♂ genitalia); ZHU & WANG (1996: 126, fig. 93 ♂ genitalia).

*Loepa damartisi szechwana* [sic]: ZHU & WANG (1993: 295).

*Loepa damartisi szechwana* [sic]: ZHU & WANG (1996: pl. VII, fig. 1 ♂).

*Loepa damartisi szechwana* [sic]: BRECHLIN & KITCHING (2010: 16; listed as synonym of *L. damartisi*, but without formal synonymisation); BRECHLIN (2010: 30; listed as synonym of *L. damartisi*, but without formal synonymisation).

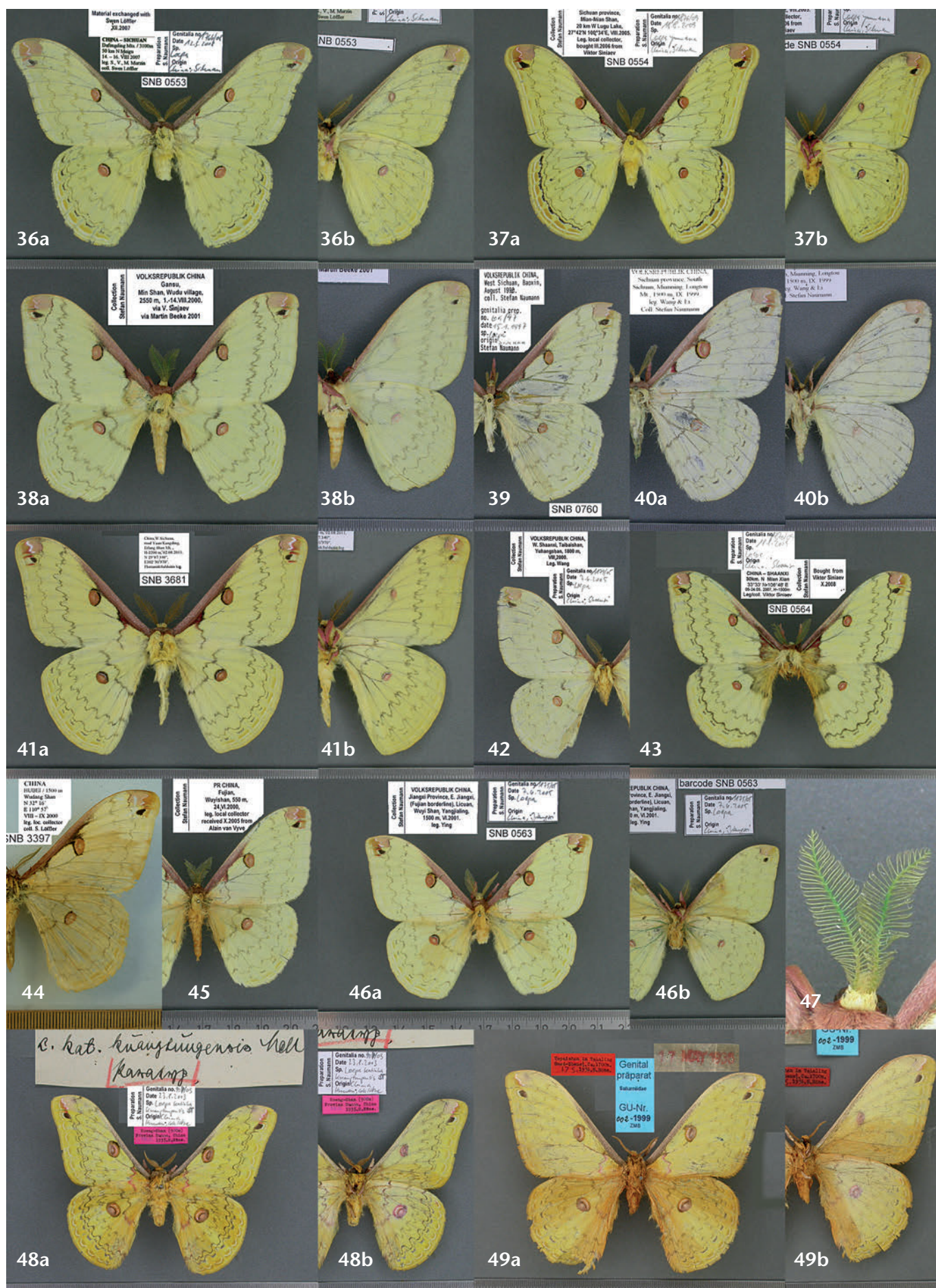
### Catalogue and diagnoses of the species of the subgroup of *L. damartisi*, with description of two new species

#### *Loepa damartisi* JORDAN, 1911

**Diagnosis:** *L. damartisi* is of light yellow ground colour and has almost round wings in both sexes. Males have a forewing length of 38–52 mm. The antemedian line of the forewing is completely coloured in carmine to violet pink, by which the species can easily be separated from all other members of the complex. The ocelli of both fore- and hindwings are relatively large, with a diameter of 4.5–6.0 mm, and almost round; those of the forewing are circled in the proximal three quarters with a black outer ring, those of the hindwing with a thinner proximal halfmoon. The outer submarginal zigzag line is completely continuous over its full length, in the hindwing the marginal stronger parts are consisting of dark blue scales. In ♂ genitalia the dorsal process of the valves is relatively elongate, compared with its relatives, the internal crest (or inner process) is long and straight, the uncus fused to one dorsal tip, and the saccus relatively compact and broad. The phallus has a right dorsolateral sclerite at its end and a second smaller one on the right dorsolateral vesica with few small thorns on it, and both are connected by a thin sclerotised band.

**Figs. 36–37:** *L. elongata* sp. n. **Figs. 36a, b:** ♂ HT, Sichuan, Dafengling Mts., 50 km N Meigu, 3100 m, VIII. 2007, leg. S., V., & M. MURZIN, ex CSLL, via CSNB in ZMHU. **Figs. 37a, b:** ♂ PT, Sichuan, Mian-Mian Shan, 20 km W Lugu Lake, VIII. 2005, CSNB. — **Figs. 38–47:** *Loepa melli* sp. n. **Figs. 38a, b:** ♂ HT, Gansu, Min Shan, Wudu village, 2550 m, 1.–14. VIII. 2000, via V. SINIAEV, ex CMBS, via CSNB in ZMHU. **Fig. 39:** ♂ PT, W. Sichuan, Baoxin, VIII. 1996 (CSNB). **Figs. 40a, b:** ♂ PT, S. Sichuan, Mianning, Longtou Mt., 1500 m, IX. 1999, WANG & LI leg., CSNB. **Figs. 41a, b:** ♂ PT, W. Sichuan, road Yaan–Kangding, Erlang Shan, 2200 m, VIII. 2011, A. FLORIANI & A. SALDAITIS leg., CSNB. **Fig. 42:** ♂ PT, Shaanxi, Taibai Shan, Yuhangshan, 1800 m, VIII. 2000, WANG leg., CSNB. **Fig. 43:** ♂ PT (variant with dark basal field), Shaanxi, 30 km N Mian Xian, 1500 m, V. 2007, V. SINIAEV leg., CSNB. **Fig. 44:** ♂ PT, Hubei, Wudang Shan, 1500 m, VIII. 2000, CSLL. **Fig. 45:** ♂ PT, Fujian, Wuyishan, 550 m, VI. 2000, CSNB. **Fig. 46a, b:** ♂ PT, E. Jiangxi/Fujian borderline, Licuan, Wuyishan, Yanglialing, 1500 m, VI. 2001, YING leg., CSNB. **Fig. 47:** Antennae of ♂ HT of *L. melli*, Gansu (see Fig. 38), CSNB. — **Figs. 48–51:** *Loepa* species of the *katinka* subgroup; all localities in PR China. — **Figs. 48a, b:** ♂ LT of *L. katinka kuangtungensis*, Hunan, Hoeng Shan, 900 m, V. 1933, H. HÖNE leg., MAK. — **Figs. 49–51:** *L. septentrionalis*. **Figs. 49a, b:** ♂ LT of *L. katinka septentrionalis*, Shaanxi, Tsinling Mts., Taibaishan, 1700 m, V. 1936, H. HÖNE leg., ZMHU. — Pictures of specimens approximately to the same scale, scale in cm with 0.5 mm subdivisions (phot. S.N.: grey scale), respectively 1.0 mm (phot. S.L.: brown scale).







**Distribution:** PR China (Sichuan, Tibet, Yunnan, Gansu, Shaanxi, Hubei, Hunan, Guizhou, Guangdong, and Fujian provinces; we do not mention the records from Chinese literature as we are rather sure that all notes on “*L. damartisi*” there refer to a different species, most likely *L. kuangtungensis*, due to a misinterpretation.

**Material examined**, all from PR China: **Sichuan:** 3 ♂♂, 70 km W Chengdu, Qingcheng Hou Mts., 1500 m, 15.–25. viii. 2004, leg. S. MURZIN, BC 0549 SNB (CSNB). 4 ♂♂, same data (CSLL). 6 ♂♂, 1 ♀, 70 km NW Chengdu, Qingcheng Hou Shan Mts., 1400 m, 16.–25. viii. 2005, leg. S. MURZIN, BC 3391, 3392 SNB (CSLL). 1 ♂, same locality and collector, but 2.–3. viii. 2007, GP 1871/09 SNB (CSNB). 15 ♂♂, Qingcheng Shan, 31°12' N, 102°47' E, 1500–1800 m, ix. 2006, leg. local coll. (CSNB). 5 ♂♂, 2 ♀♀, Lu Zhou, 2000 m, viii. 2008, leg. ZHOU Ping, BC 3388, 3389 SNB (CSLL). 2 ♂♂, 1 ♀, same data, ex CSLL (CSNB). 2 ♂♂, same data, 1 GP 2331/12 WAN, ex CSLL (SMFL). 1 ♂, (W), Baoxin, viii. 1996, GP 63/97 SNB (CSNB). 1 ♂, Mou-Pin, 1897, leg. R. P. DEJEAN (NHMW). — **Xizang Zizhiqu Auton. Region** (Tibet): 26 ♂♂, Linzhi County, Famudul, ca. 3000 m, 1.–20. viii. 2005, leg. local coll. (CSNB). — **Yunnan:** 3 ♂♂, (C), Ailao Mt., 3500 m, ix. 1999, leg. WANG & LI, GP 1168/05 SNB (CSNB). 1 ♂, same data, GP 1320/00 WAN, ex CSNB (SMFL). 1 ♂, Mt. Dabaoshan, Huaping County, 1.–25. vii. 2008, leg. Li Jingke, BC 3390 SNB (CSLL). 4 ♂♂, central east Lanchang County, E Simao City, Heishan Mt., 2200–2400 m, ix. 1999, leg. WANG & LI, GP 1178/05 SNB, BC 0548, 0762 SNB (CSNB). 1 ♂, same data (CWAN in SMFL). 2 ♂♂, (S), Langchang, Hei Mt., 2500 m, ix. 1999, leg. LI & WANG, BC 3382, 3383 SNB (CSLL). 1 ♂, (S), Langchang, Hei Mt., 2300 m, viii. 1999, leg. ZHI (CSLL). — **Shaanxi:** 1 ♂, (S), Ankang env., vii. 1997, leg. MA (CSNB). 6 ♂♂, same locality, 1090 m, viii., ix. 1998, leg. local coll., BC 0550 SNB (CSNB). 1 ♂, same data, c/o T. LIESE in CSNB (SMFL). 5 ♂♂, 1 ♀, Taibai Shan, Yuhangshan, 1800 m, viii. 2000, leg. WANG (CSNB). 1 ♂, same data, ex CSNB (SMFL). 1 ♂, 15 km S Shou Man vill., Daba Shan, 1800 m, ix. 2000, BC 3387 SNB (CSLL). 2 ♂♂, Liayang, 20.–30. vii. 2010, leg. E. KUČERA (CSNB). — **Gansu:** 1 ♂, Danque, Duoershan, 4000 m, viii. 2005, leg. LI et al. (CSNB). — **Hubei:** 10 ♂♂, Dahongshan, Shuizhou, 1600 m, viii. 2009, leg. JIN, BC 3380, 3381 SNB (CSLL). — **Hunan:** 1 ♂, Nanchang, x. 1999 (CSNB). 7 ♂♂, Huaihua, Huangyuan Mt., 1200 m, ix. 2001, leg. LI & WEN, GP 1169, 1177/05 SNB, BC 0551, 0761 SNB (CSNB). — **Guizhou:** 11 ♂♂, (E), Kaili env., Leigongshan, ca. 26°15' N, 108°5' E, 1500 m, ix. 2001, leg. LI, GP 1170/05 SNB, BC 2751, 2752 SNB (CSNB). — **Guangdong:** 1 ♂, Shikankong, Ruyuan, 1350–1500 m, leg. YIN, BC 3386 (CSLL). — **Fujian:** 2 ♂♂, Wuyishan, 600 m, vii. 1999, ex coll. M. HAAS, BC 3384, 3385 SNB (CSLL). 11 ♂♂, (N), Bijiaoshan, Renshou, ix. 2002, leg. LI et al., GP 1171/05 SNB, BC 0552 SNB (CSNB). 4 ♂♂, same data, 1 GP 2072/09 WAN (via CSNB in SMFL).

**Notes:** Although nicely figured in the original description, all known records of “*L. damartisi*” in Chinese literature refer to a different species, *L. kuangtungensis*, which even belongs to a different group within the genus *Loepa* and immediately can be separated from *L. damartisi* by its intensive yellow colour, more elongate forewing form, much smaller size and a bifid uncus tip. This error probably is based on a misinterpretation by ZHU & WANG (1983) who even figure the ♂ genitalia of *L. kuangtungensis* under “*L. damartisi*”. Thereby also the foodplant records for *L. damartisi* cited in Chinese literature (and translated from there and erroneously repeated in ROBINSON et al. 2001) probably do not deal with *L. damartisi*. We have to assume that the early instars and their foodplants remain currently unknown for *L. damartisi*.

## *Loepa taipeishanensis* MELL, 1939

**Diagnosis:** *L. taipeishanensis* is a small, light yellow coloured species with rounded fore- and hindwings. ♂♂ have a forewing length of 38–45 mm, the only known ♀ has a fw. length of 48 mm. The antemedian line of the forewing is narrow and grey, ending in some specimens with a proximal carmine shadow at the costa; that of the hindwing is grey. The ocelli of both fore- and hindwings are relatively small, 3.0–4.5 mm in diameter, and almost round; those of the forewing are circled in the proximal half with a thin black outer ring, those of the hindwing with a broader proximal halfmoon. The postmedian and submarginal lines are only slightly indicated, in some specimens they are almost completely reduced, so that they appear to be entirely coloured in their ground colour (Fig. 15). The antennae of fresh specimens often are of intensive green colour and later in most cases fade to ochreous brown, similar to specimens of *L. wingana* and *L. melli* sp. n., described below. In ♂ genitalia the dorsal process of the valves is short and rounded, the ventral process is short and slender, and the internal crest (or inner process) of the valves is almost a straight structure without any larger protuberances. The uncus is quite short and fused at its tip, the saccus is broad-based. The phallus is short, with a sclerotised field at its right lateral end, the vesica has a small sclerite on the right dorsolateral side.

**Distribution:** *L. taipeishanensis* is known only from some localities in the Qinling mountains of central and eastern Shaanxi and slopes of nearby northern Hubei provinces. It occurs at altitudes of 1350–1700 m.

**Material examined**, all from PR China: **Shaanxi:** 68 ♂♂ (including type material), Tapeishan im Tsinling, ca. 1700 m, vii. & viii. 1935 & 1936, leg. H. HÖNE, GP 675/93 WAN (MAKB). 1 ♂, Qinling Mts., Foping env., 33°35' N, 108°1' E, 1500 m, ix.–x. 2005, leg. local coll., BC 0765 SNB (CSNB). 1 ♂, same data, BC 3402 SNB (CSLL). 1 ♂, Tsinling Mts., Taibai Shan, Houzhenzi village, 33°53' N, 107°49' E, 1600 m, 20. ix.–12. x. 1999, leg. V. SINIAEV & A. PLUTENKO, GP 1874/09 SNB, BC 0558 SNB (CSNB). 2 ♂♂, same locality, 1500 m, v. 2006, leg. local collector, BC 0767 SNB (CSNB). 1 ♂, same locality, ix. 2001, GP 1176/05 SNB (CSNB). 15 ♂♂, same locality, 1× GP 2073/09 WAN (in CWAN in SMFL). 12 ♂♂, (E), Yuhangding, Shanguan, 1600 m, viii. 2000, leg. WANG, GP 1180/05 SNB, BC 0769, 0770 SNB (CSNB). 9 ♂♂, Daiwanshan, Xunyang, 1350 m, ix. 2000, leg. WANG, BC 3398, 3399, 3400 SNB (CSLL). 1 ♀, Ning Shan, 1500 m, ix. 2001, BC 3403 SNB (CSLL). — **Hubei:** 1 ♂, Wudang Shan, 1500 m, viii. 2000, BC 3396 SNB (CSLL).

**Notes:** *L. taipeishanensis* was found to occur in part syntopically and synchronously with *L. damartisi* in the Qinling Shan, and it was also found to occur together with *L. melli* sp. n., described below, at some localities in Shaanxi, Qinling Shan, and in NW Hubei. Records of that species in May are rare, but we believe that they are true as the material came from a reliable source via Viktor SINIAEV; such early records may be caused by early warm weather in certain years, although the normal flight time is much later in late summer and autumn; alternatively it may be an early first generation at lower elevations in warm areas, with the late summer specimens at these places being a [partial?] second generation.



## *Loepa wlingana* YANG, 1978

= *Loepa miranda* †*septentrionalis* MELL, 1939 (senior subjective synonym but unavailable homonym; replaced by *wlingana* YANG, 1978)

= *Loepa damartisi* *szechwana* ZHU & WANG, 1993 (junior subjective synonym, syn. n.)

**Diagnosis:** *L. wlingana* is the smallest species in the complex of *L. damartisi*, and also the only one where ♀♀ are found to be regularly attracted by light. It shows also the narrow grey antemedian line as *L. taipeishanensis*, but ending in all ♂♂ and ♀♀ specimens on the forewing costa with a narrow proximal carmine shadow. ♂♂ have a forewing length of 37–43 mm, ♀♀ 37–41 mm. In ♂♂ the forewing ocelli are of somewhat larger diameter of 3.5–5.0 mm, compared to *L. taipeishanensis*, and are in almost all specimens connected by a small eyelid-like pattern with the forewing costa; those of the hindwing are a little more rounded than in *L. taipeishanensis*. ♀♀ have generally smaller ocelli than ♂♂, but the same eyelid on their forewings; due to few or no known ♀ specimens in the other taxa a comparison is impossible. The ornamentation is somewhat more intense compared with *L. taipeishanensis*, ♀♀ are of much more intense yellow ground colour than ♂♂. As in *L. taipeishanensis* and *L. melli* sp. n., the antennae of fresh ♂ specimens often are of intensive green colour and fade later to ochreous brown in most cases. ♂ genitalia are similar to those of *L. taipeishanensis*, the saccus a little wider, the internal crest (or inner process) of the valves with a dorsal knob-like protuberance, and uncus and phallus are somewhat shorter.

**Distribution:** *L. wlingana* is distributed in most of the northeastern provinces of China, with some single records from the south in Sichuan and Guangxi.

**Material examined**, all from PR China: Hebei: Xinglong, Wuling Mountains, 1700 m, 23. VIII. 1973, at light, leg. YANG Jikun (HT of *L. wlingana*, examined from photo in publication only, China Agricultural University). 2 ♂♂, 4 ♀♀, Fenling County, Yunwushan, 1600 m, VIII. 2003, leg. YING, ♂ GP 1181/05 SNB, BC 0561, 0768 SNB (CSNB). 3 ♂♂, 5 ♀♀, same data, BC 3404, 3405, 3406 SNB (CSLL). — Shanxi: 10 ♂♂, 1 ♀, Mien Shan, upper altitude 2000 m, VII.–VIII. 1937, leg. H. HÖNE, GP 906/03 SNB, GP 681/93 WAN (partially type series of *L. miranda taipeishanensis*, MAKB). — Beijing vicinity: 2 ♂♂, 110 km NW Mentougou, Xiaolongmen Forest Stat., 39°58' N, 116°E, 1100 m, 1. VIII. 2000, leg. A. SCHINTLMEISTER, GP 1173/05 SNB, barcode SNB 0560 (CSNB). 1 ♂, same data, BC 3395 SNB (CSLL). 2 ♂♂, same data, 1 GP 2330/12 WAN, CWAN (in SMFL). 1 ♂, Dongling Mt., 39°57' 7.2" N, 115°25'38.9" E, 1400 m, birch forest, 26. VII. 2011, leg. ZOU Yi & WARREN-THOMAS leg., BC SNB 4090 (coll. ZOU Yi). 1 ♂, label with Chinese letters, 29. VII. 1983, MHNL 47002390, abdomen missing (coll. TERRAL in MHNL). — Liaoning: 8 ♂♂, 4 ♀♀, Benxi, Qianshan, 1700 m, VIII. 2005, leg. YI et al., ♂ GP 1456/06, 1875/09 SNB, BC 0562, 0771 SNB (CSNB). — Sichuan: 1 ♂, Huili, Liang Shan, leg. HAN Yinheng (HT of *L. damartisi szechwana*, examined from photo, CCAS). — Guangxi: 1 ♂, (W), TianE, Datingshan, 1300 m, VIII. 2005, leg. YI et al., BC 0764 SNB (CSNB).

**Notes:** Although mainly distributed in the northeast of China, there exist two records of specimens from more southern provinces, namely the HT of *L. damartisi szechwana*, plus one specimen from Guangxi. These two ♂ specimens are externally absolutely identical with

typical northeastern specimens with connected forewing ocellus, and within the results of the COI barcode analysis at least the specimen from Guangxi showed absolutely no differences to northern specimens. There are no sequence results for the HT of *L. damartisi szechwana* in the BOLD project as no samples of it were examined, but alone from the specimen and from the genitalia figure in ZHU & WANG (1993, 1996) the identity is certain to us. As there are two specimens, originating from different sources and from different southern provinces, we do not believe that the locality data of both got mixed up and the specimens in fact came also from NE China, just being labelled with wrong collecting data.

An almost full-grown larva of an undetermined Saturniidae species was shown on a Chinese internet platform in 2006 which immediately was identified to be a *Loepa* caterpillar in a very strange green ground colour. Due to contact with the author of that photo we are happy to present here the first known larva of the *damartisi*-complex in print (Fig. 35); LI Kai kindly permitted us to use his photo here (downloaded from the Web), and gave some details about the origin of the larva: The photo was taken in Song Shan Natural Reserve, somewhere northwest of Beijing, in 2006. Alone from the locality it is clear that it must be *L. wlingana*, as no further *Loepa* species is known to exist in that area. The larva is bluish green, with a more vivid green lateral part and bluish spiracles; the warts on top of the scoli are yellow. This greenish ground colour is a very unique colouration within the entire genus *Loepa*, where larvae otherwise (as far as they are known) are coloured in more brownish or red colours (see, e.g., photos in NAUMANN et al. 2008). A larval foodplant was not recorded by LI Kai.

Ova received by S.N. in VIII. 2003 from Hebei which were deposited there by ♀♀ which were also sent to Germany later, did not produce any larvae. The eggs are of creamy whitish colour, almost round, and a little flattened (Fig. 34).

In addition to those three taxa, we here describe two further new species:

## *Loepa elongata* sp. n.

**Holotype** (Figs. 36a, b dorsal, ventral view): ♂, PR China, Sichuan Prov., Dafengding Mts., 50 km N Meigu, 3100 m, 14.–16. VIII. 2007, leg. S., V. & M. MURZIN, ex CSLL, exchanged XII. 2007, GP 1766/08 SNB, BC 0553 SNB (CSNB). The HT will be deposited in ZMHU, Berlin.

**Paratypes** (Figs. 37a, b; in total 20 ♂♂, all PR China): **Sichuan:** 13 ♂♂, same data as HT, BC 2645 SNB (CSLL). 2 ♂♂, same data as HT, BC 0775 SNB (CSNB). 1 ♂, Mian-Mian Shan, 20 km W Lugu Lake, 27°42' N, 100°34' E, VIII. 2005, leg. local coll., barcode SNB 2644 (CSLL). 1 ♂, same data, GP 1876/09 SNB, BC 0554 SNB (CSNB). 1 ♂, PR China, "Tatsien-lou, Tibet" [= Sichuan, Kangding, 30°3' N, 102°2' E, 2600–3000 m], leg. Prince H. d'ORLÉANS (MNHN). — **Yunnan:** 2 ♂♂, Mt. Dabaoshan, Huaping county, 1.–25. VII. 2008, leg. LI Jingke, BC SNB 2646 (CSLL).

**Etymology:** The species is named after the elongated forewing form which is quite unusual for the complex of otherwise more rectangular-shaped species around *L. damartisi*.

**Diagnosis:** *L. elongata* is the largest taxon within the *damartisi*-subgroup, with typical elongated forewings in the ♂♂. It is of the same light yellow colour as all other members, with black forewing antemedian line with purple shadow at costal end, and small rounded wing ocelli. The outer submarginal line of the hindwing is somewhat variable, with disconnected blue parts or an entire, intensively dark blue line as extremes of the possible variability range. There are some similarities to *L. yunnana*.

**Description:** ♂ (Figs. 36–37): Ground colour light yellow. Antennae ochreous with green shadow, quadripectinate, 12.5–13.0 mm long. Collum greyish, thorax and abdomen in ground colour, legs covered completely with purple hair. The stigmata appear as a row of black dots on lateral side of the abdomen. The forewings have an elongated apex, the length is 49–53 mm. On dorsal side costa grey in the proximal two thirds, antemedian line of the forewing black, with a purple shadow at its costal end. The ocelli relatively small, round, with a black outer ring on the proximal side of the ocellus. It is followed by a weak postmedian line and two submarginal lines, of which the outer one is only very slightly indicated. The antemedian line of the hindwing black, ocellus as in forewing, but a little smaller, postmedian line as in forewing, and the two submarginal lines more intensive than those of the forewing, the marginal one variable from almost interrupted (HT, Fig. 36) to entirely intensively dark blue (PT, Fig. 37) as extremes of the variability range. On ventral side the costa is more purplish grey, in general the markings are less indicated, the forewing antemedian line is missing, but the yellow colour is a little more intensive.

**♂ genitalia** (Figs. 67–68): In concordance with the size of the specimens, also the genitalia of *L. elongata* are the largest ones in the complex. Uncus fused, relatively slender and long, dorsal process of the valves widely rounded, the ventral one is the largest in the complex, and the internal crest (or inner process) has a dorsal round protuberance and otherwise is well pronounced. Saccus long and broad, the phallus also quite long, with a distal sclerotisation with thorn-like spine on right lateral side. The vesica has two bulbs, with a smaller sclerite on right ventrolateral side and a bigger one with thorn on dorsal side.

**♀:** unknown.

**Notes:** *L. elongata* is distributed along the southern borderline of Sichuan to Yunnan at high altitudes of 2600–3100 m. There are some similarities in its wing pattern with *L. yunnana* which also occurs at high altitudes, but the latter is known only from further southwest in Yunnan, has different ♂ genitalia and a more compact, square-like wing shape. Specimens of *L. yunnana* are figured by NAUMANN (2003: 163, fig. 4) or by NAUMANN & LÖFFLER (2012). Also the results of the COI barcode analysis (Text-Fig. 1) show that *L. yunnana* is placed at a different position and evidently not conspecific with *L. elongata*.

## *Loepa melli* sp. n.

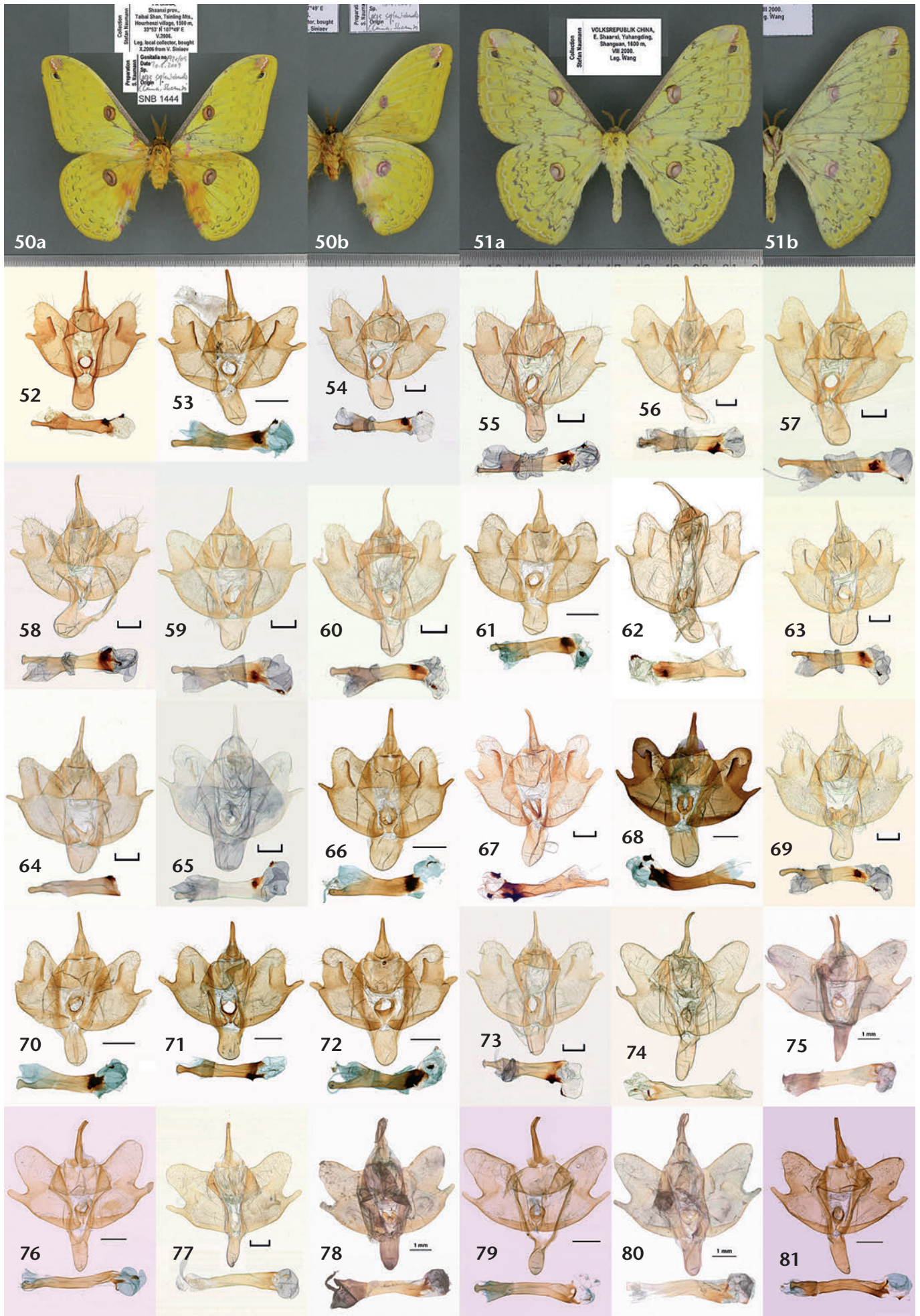
**Holotype** (Figs. 38a, b dorsal, ventral view): ♂, PR China, Gansu Prov., Min Shan, Wudu village, 2550 m, 1.–14. viii. 2000, via V. SINIAEV, via M. BEEKE (CSNB). The HT will be deposited in ZMHU, Berlin.

**Paratypes** (Figs. 39–47, in total 37 ♂♂, all PR China): **Gansu:** 1 ♂, same data as HT, GP 1172/05 SNB (CSNB). 3 ♂♂, same data as HT (CMBS). 2 ♂♂, same data as HT (CWAN in SMFL). 1 ♂, Min Shan, 50 km W Wudu, 2400 m, 8. viii. 2000, BC 0763 SNB (CSNB). 1 ♂, same locality, 35°30' N, 104°35' E, 2350 m, 27. vii.–14. viii. 2000, leg. SINIAEV & PLUTENKO, GP 1873/09 SNB, BC 0559 SNB (CSNB). 7 ♂♂, same locality, 2350 m, 27. vii.–14. viii. 2000, leg. PLUTENKO & SINIAEV, BC 3393, 3394 SNB, ex CMWM (CSLL). 1 ♂, same locality, viii. 2000, via CSLL in CMBS. — **Shaanxi:** 6 ♂♂, Taibai Shan, Yuhangshan, 1800 m, viii. 2000, leg. WANG, GP 1174, 1179/05 SNB, BC 0556, 0766 SNB (CSNB). 1 ♂, Qinling Mts., Foping env., ix.–x. 2005, BC 3401 SNB (CSLL). 1 ♂, 30 km N Mian Xian, 33°33' N, 106°46' E, 1500 m, 5.–24. v. 2007, leg. V. SINIAEV, GP 1870/09 SNB, BC 0564 SNB (CSNB). — **Sichuan:** 2 ♂♂, (W), Baoxin, viii. 1996, GP 61, 62/97 SNB, BC 0557, 0760 SNB (CSNB). 2 ♂♂, (S), Mianning, Longtou Mt., 1500 m, ix. 1999, leg. WANG & LI (CSNB). 1 ♂, Qionglai Shan, 31° 13' N, 102°23' E, 1400 m, v. 2006, GP 1872/09 SNB, BC 0555 SNB (CSNB). 2 ♂♂, (W), road Yaan–Kangding, Erlang Shan, 29°87.340' N, 102°30.970' E, 2200 m, 2. viii. 2011, leg. FLORIANI & SALDAITIS, BC 3681 SNB (CSNB). — **Xizang Zizhiqu auton. region** (Tibet): 2 ♂♂, Linzhi County, Famudul, ca. 3000 m, 1.–20. viii. 2005, leg. local collector (CSNB). — **Hubei:** 1 ♂, Wudang Shan, 1500 m, viii. 2000, BC 3397 SNB (CSLL). — **Fujian:** 1 ♂, Wuyishan, 550 m, 24. vi. 2000, leg. local collector (CSNB). — **Jiangxi:** 2 ♂♂, (E), Fujian borderline, Licuan, Wuyishan, Yanglialing, 1500 m, vi. 2001, leg. YING, GP 1175/05 SNB, BC 0563 SNB (CSNB).

**Etymology:** The new taxon is dedicated in honour to the late Rudolf E. MELL (1878–1970), a famous German entomologist and teacher (cf. SCHINTLMEISTER 2008) who went after World War I to China where he worked in schools in Guangdong province and did a lot of entomological field work. His

**Figs. 49–51: *L. septentrionalis*.** **Figs. 50a, b:** *L. septentrionalis* ♂, Shaanxi, Tsinling Mts., Taibai Shan, Houzhenzi village, 1600 m, v. 2006, CSNB. **Fig. 51a, b:** *L. septentrionalis* ♀, E. Shaanxi, Yuhangding, Shanguan, 1600 m, viii. 2000, WANG leg., CSNB. — Pictures of specimens almost to the same scale, scale in cm with 0.5 mm subdivisions. — **Figs. 52–81: ♂ genitalia.** — **Figs. 52–58: *L. damartisi*:** **Fig. 52:** Sichuan, GP 63/97 SNB. **Fig. 53:** Sichuan, GP 1871/09 SNB. **Fig. 54:** Yunnan, GP 1168/05 SNB. **Fig. 55:** Yunnan, GP 1178/05 SNB. **Fig. 56:** Hunan, 1169/05 SNB. **Fig. 57:** Guizhou, 1170/05 SNB. **Fig. 58:** Fujian, GP 1171/05 SNB. — **Figs. 59–61: *L. taipeishanensis*:** **Fig. 59:** Shaanxi, GP 1176/05 SNB. **Fig. 60:** Shaanxi, GP 1180/05 SNB. **Fig. 61:** Shaanxi, GP 1874/09 SNB. — **Figs. 62–66: *L. wlingana*:** **Fig. 62:** PLT *L. miranda septentrionalis*, Shanxi, GP 906/03 SNB. **Fig. 63:** Beijing, GP 1173/05 SNB. **Fig. 64:** Hebei, GP 1181/05 SNB. **Fig. 65:** Liaoning, GP 1456/06 SNB. **Fig. 66:** Liaoning, GP 1875/09 SNB. — **Figs. 67–68: *L. elongata* sp. n.:** **Fig. 67:** HT *L. elongata*, Sichuan, GP 1766/08 SNB. **Fig. 68:** PT *L. elongata*, Sichuan, GP 1876/09 SNB. — **Figs. 69–73: *Loepa melli* sp. n.:** **Fig. 69:** PT *L. melli*, Gansu, GP 1172/05 SNB. **Fig. 70:** PT *L. melli*, Gansu, GP 1873/09 SNB. **Fig. 71:** PT *L. melli*, Shaanxi, GP 1870/09 SNB. **Fig. 72:** PT *L. melli*, Sichuan, GP 1872/09 SNB. **Fig. 73:** PT *L. melli*, Jiangxi, GP 1175/05 SNB. — **Figs. 74–77: *Loepa kuangtungensis*:** **Fig. 74:** LT *L. katinka kuangtungensis*, Hunan, GP 904/03 SNB. **Fig. 75:** PLT *L. katinka kuangtungensis*, "China, viii. 1912, Tong-cung-san, MELL S.V.", GP 004-1999 ZMB. **Fig. 76:** Guangdong, GP 1910/09 SNB. **Fig. 77:** Guizhou, GP 1182/05 SNB. — **Figs. 78–81: *Loepa septentrionalis*:** **Fig. 78:** LT *L. katinka septentrionalis*, Shaanxi, GP 002-1999 ZMB. **Fig. 79:** Shaanxi, GP 1921/09 SNB. **Fig. 80:** PLT, Shaanxi, "Tapeishan im Tsinling, Sued-Shensi (China), ♂, 29. vi. 1935, H. HÖNE", GP 001-1999 ZMB. **Fig. 81:** Gansu, GP 1923/09 SNB. — Figures not to the same scale, scalebars (where present) = 1 mm. — Photos S. NAUMANN, except Figs. 20, 21, 44 (S. LÖFFLER), Figs. 14, 16, 23 (W. A. NÄSSIG), Figs. 75, 78, 80 (scans W. ECKWEILER), Figs. 25, 25c (XUE Dayong), Fig. 35 (Li Kai).







work was dealing with the local fauna of both Heterocera and Rhopalocera; his scientific material went to different museum collections, Saturniidae are mainly deposited in MAKB and ZMHU today (see also HORN et al. 1990: 258, SCHINTLMEISTER 2008: 417).

**Diagnosis:** *L. melli* is on average larger than *L. taipeishanis* or *L. wlingana*, but otherwise shows many similarities to those two taxa. It has a round forewing, the hindwing in most cases has a slightly bent outer margin. It is of the same light yellow colour as all other members of the subgroup, with black forewing antemedian line with purple shadow at costal end, and medium sized, round wing ocelli. The markings are more intensive than in the smaller *L. taipeishanis*, and in many specimens the antennae of ♂♂ are green and keep that colour for a longer time in the collection.

**Description:** ♂ (Figs. 38–46): Ground colour light yellow. Antennae vivid green, sometimes fading to ochreous colour, quadripectinate, 12.0–13.0 mm long. Collum and costa purplish grey, frons, thorax, and abdomen in the ground colour, legs covered completely with purple hair. The spiracles are almost invisible on lateral side of the abdomen. The forewings are round or nearly slightly square-like, their length is 43–52 mm. It is obvious that specimens from higher altitudes are larger than those from lower altitudes. On dorsal side costa purplish grey in the proximal ca. 80%, antemedian line of the forewing black, with a purple shadow at its costal end. The ocelli medium sized, round, almost completely circled with a black outer ring, only few outer parts not covered. It is followed by a wavy postmedian line and two submarginal lines, of which the outer one is only very slightly indicated and broken in most cases. The antemedian line of the hindwing black, ocellus similar as in forewing, but a little smaller and flattened, postmedian and the two submarginal lines as in forewing. On ventral side the costa is more purplish, in general the pattern is less expressed, the forewing antemedian line is lacking, and the black outer circle of the ocelli is missing, but the yellow colour is a little more intensive.

**♂ genitalia** (Figs. 69–73): The uncus is slender and the tips fused at its end. The dorsal process of the valves is short and round, with a lateral indentation which makes this upper process somehow ear-like; the ventral process is broader than in *L. taipeishanis* or *L. wlingana*, the internal crest (or inner process) is a little bent. The saccus is round and broad-based. The phallus is medium-sized, longer than in *L. taipeishanis*, with a sclerotised portion at its right lateral end with thorn-like projection on it, the vesica with two bulbs, the dorsal one with a reduced proximal sclerite line, sometimes with small projections on it.

**♀:** unknown.

**Notes:** *L. melli* is a relatively widespread species, with its focus in western provinces; there are only a few records for Fujian and Jiangxi. We found a positive correlation of larger size and higher altitudes of its collecting sites. In the Qinling Mts., Taibaishan, it occurs syntopically with *L. taipaishanis*, and in Sichuan (there partly) and Fujian

with *L. damartis*. Nevertheless, by external morphology of the imago and ♂ genitalia plus information resulting from the mtDNA (COI barcode) sequence analyses the species can be separated easily.

There is one specimen from Shaanxi, 30 km N Mian Xian, in CSNB which has darkened antemedian areas and more intensive markings than other specimens (Fig. 43). When this specimen was received, V. SINIAEV (pers. comm.) informed one of the authors (SN) that there was a little series of that form of the same origin which unfortunately got destroyed still in China before it could be examined in more detail. Examination of the genitalia and barcoding results of the singleton in CSNB confirmed the conspecificity with *L. melli*. We interpret that morph as a partly melanistic individual or local form.

## Discussion

### General notes

Currently we know 5 species within the subgroup of *L. damartis* in total. All are confined to mountainous areas in China, with one species, *L. elongata* sp. n., occurring at very high altitudes; so far no records exist for neighbouring countries (see, e.g., NAUMANN et al. 2008 for Myanmar, Kachin State, borderline to Yunnan). Few is known about the biology of the species so far: apparently only one larval photo (of *L. wlingana*) exists. Eggs of the same species which were deposited by a ♀ from Hebei in VIII. 2003 and sent to SN did not result in hatching caterpillars, although all efforts were taken to hibernate them carefully in partitions under different conditions. Records of larval foodplants for *L. damartis* in Chinese literature most probably refer to species belonging to the species-group of *L. katinka*, as is shown above. As far as can be seen from the accumulated collecting data, all species fly in late summer and autumn, mainly in the months of VII. to IX., with some few outliers which were collected in the months of V. and X. (possibly for some early species representing an additional spring generation at lower altitudes?). Consequently, it appears to be plausible that in this group the ova are hibernating. It is astonishing that only few or even no ♀♀ are known for 4 of the 5 taxa, but in *L. wlingana* obviously ♀♀ can regularly be collected at light. Lots of effort may be necessary to try to find further details on the biology of this rarely collected complex.

### mtDNA COI barcode analyses

In contrast to the results within the *yunnana*-subgroup (NAUMANN & LÖFFLER 2012), where all species defined by morphological characters are also quite clearly defined in the COI barcode results with rather high bootstrap values and rather high percentages of genetic difference, this is not the same for the *damartis*-subgroup.

First, the triple cluster in the ML tree (Text-Fig. 1) consisting of *L. damartis*, *L. taipeishanis* and *L. melli* is not very clear; especially *L. taipeishanis* is only weakly defined by this method, and all three species do not differ from their



next relative much over 1% at maximum. From zoogeographical viewpoint, *L. taipeishanis* appears to be a quite young species, being confined to a single mountain range only (the Qinlingshan), while the two other species are much more widely distributed across China (see map, Fig. 1). This might possibly explain why *L. taipeishanis* has not yet fully separated its COI genetics from its relatives (which is, being only maternally dispersed to the offspring, a matter which may take time). Alone on basis of the barcode COI sequences the 3 populations should not have been split up into species; however, constant morphological differences and (in part) sympatric and synchronous occurrence within the Qinlingshan mountain chain (of *L. taipeishanis* and *L. melli*) much better support the distinctness of the three species.

A similar explanation might be responsible for the high intraspecific variability of *L. elongata*, which also appears to have only a rather small distribution area and also forms a well-structured mtDNA cluster. *L. elongata* as a species is, however, quite well-defined and separated from its relatives by the COI barcode sequences within the *damartis*-subgroup.

*L. damartis* itself is remarkable for the high intraspecific variability of the COI sequences, which is in some cases larger than within the 3-species cluster of *L. damartis*, *L. taipeishanis* and *L. melli*, with especially the Sichuan population (and a part of the neighbouring Yunnan population) being rather distinct, while the other populations are on average more similar to each other. Perhaps *L. damartis* has a high tendency of splitting up into local populations with reduced gene flow in between, or there might still be some cryptic diversity involved which cannot be detected in morphology of the imagines so far.

As the morphological differences are often small or subtle and hard to be interpreted in terms of evolutionary directions (and thus also hard to be pressed into a plausible scheme for a statistical analysis), we have not constructed an integrative tree using both morphological and mtDNA characters for the phylogeny analysis. Further research is surely necessary to solve these questions.

## Conclusions

On basis of current knowledge we can present the following checklist for the revised 5 species of the subgroup of *L. damartis*:

- *Loepa damartis* JORDAN, 1911
- *Loepa taipeishanis* MELL, 1939
- *Loepa wlingana* YANG, 1978
  - = *Loepa miranda septentrionalis* MELL, 1939 (older subjective synonym, but unavailable primary homonym, replaced by *wlingana* YANG, 1978)
  - = *Loepa damartis szechwana* ZHU & WANG, 1993 (junior subjective synonym)
- *Loepa elongata* NAUMANN, LÖFFLER & NÄSSIG, sp. n.
- *Loepa melli* NAUMANN, LÖFFLER & NÄSSIG, sp. n.

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